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ABSTRACT

The proceedings of the First World Conference on Engineering Education focus on future directions, case studies, and unique high-impact programs. The report contains the following: (1) a list of summary statements on ideas, trends and observations; (2) summaries of the 16 sessions in which salient points are noted; and (3) the complete text of three papers omitted from the conference report. Topics include the super industrial revolution, adult motivation, continuing education and the government, professional society programs, university programs, and industry/government programs. Six hundred participants from 56 countries attended the conference which was cosponsored by the University of Mexico; the American Society for Engineering Education (ASEE); the United Nations Educational, Scientific and Cultural Organization (UNESCO); the Pan American Health Organization (PAHO); the Pan American Union of Engineers Association (UPADI); and the Secretariat of Human Settlement and Public Works of Mexico (SAHOP). (Author)

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SUMMARY & EVALUATION

First World Conference on Continuing Engineering Education

April 25-27, 1979

Mexico City

U.S. DEPARTMENT OF HEALTH EDUCATION & WELFARE NATIONAL INSTITUTE OF EDUCATION

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SE 033 607

SUMMARY & EVALUATION

First World Conference on Continuing Engineering Education

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SEPTEMBER 1979

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Foreword

For those who did not attend the First World Conference on Continuing Engineering Education, April 25-27, 1979, it was a worthy beginning to focus attention on this major international concern and bring a wide variety of people in continuing education together. The program focused on future directions, case studies, and unique high-impact programs.

The attempt of this postprogram report is to bring the First World Conference to a closure with a moderate evaluation and assurance that the full value of the reports, ideas, and trends were analyzed and made known to a wide spectrum of the continuing education public. The analysis of how the program developed and what the strengths and weaknesses were are explained. The impact on education as a whole is minimal, but on continuing education it is substantial. Beyond the exchange of ideas and establishment of relations there comes a new respectability for a field which in traditional setting has held a backseat position.

This report draws the strings around the conference and its impact to help us all plan a future course of action.

We appreciate the untold hours of the many people who were not here-to-fore mentioned and the special sacrifices of families, institutions, and others. We especially want to thank the National Science Foundation for the opportunity to do this special evaluation and summary of the First World Conference.

John P. Klus
Conference Chairman

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I INTRODUCTION

The First World Conference on Continuing Engineering Education (CEE) was a major event that drew over 600 participants from 56 countries. The Conference was cosponsored by the University of Mexico; the American Society for Engineering Education (ASEE) through its International Division and its Continuing Professional Development Division; the United Nations Educational, Scientific and Cultural Organization (UNESCO); the Pan American Health Organization (PAHO); the Pan American Union of Engineers Association (UPADI); and the Secretariat of Human Settlement and Public Works of Mexico (SAHOP).

A grant from the Exxon Foundation defrayed the cost of publishing the Proceedings, which were made available at the start of the Conference. PAHO made possible the participation of several participants from Central and South America. UNESCO supported several persons from less developed countries, in addition to the 12 members of the International Working Group on Continuing Education of Engineers and Technicians.

The National Science Foundation (NSF), through a grant to ASEE, enhanced the value of the Conference for U.S. participants. NSF partially funded the participation of 39 U.S. educators, mainly from colleges and universities. All were involved in continuing engineering education or were in the program-planning stage. Since the Conference languages were English, French, and Spanish, NSF paid for approximately half the personnel and equipment charges for simultaneous interpretation. In addition, this publication, a summary of events from the First World Conference, was funded by NSF.

The Planning Committee members for the Conference were:

Beltran, Francisco Alejandra
SAHOP
Mexico City, Mexico

Biedenbach, Joseph M.
University of South Carolina
Columbia, SC

Etienne, Gerard
PAHO
Washington, D.C.

Klus, John P., CHAIRMAN
University of Wisconsin
Madison, WI

Pereda, Pedro Martinez
University of Mexico
Mexico City, Mexico

Yackolev, Vladimir
UPADI
Caracas, Venezuela

Section II in this report contains ideas, trends, and observations from the Conference overall. Sixteen persons were each requested to summarize and evaluate a particular session. Section III contains their summaries and an overview of Conference events. Three papers were received too late to be included in the Proceedings; these papers are reprinted in Section IV in this report. In the final section are strengths and weaknesses of the Conference, and an overall evaluation.

This publication is intended as a supplement to the Proceedings and was sent to all U.S. participants.

1st World Conference

II OBSERVATIONS AND TRENDS

- Courses developed in one country are not always useful in other countries.
- The level of educational technology use throughout the world is minimal.
- X • Future opportunities in continuing education will exist in cross-discipline subject areas.
- For continuing education programs to be successful, an interest and commitment on the part of the employer and on the part of the students is necessary.
- The governments of the various countries represented are taking an aggressive, active role to assure that CEE becomes a reality in their country.
- X • Business and industry worldwide are increasing their CEE efforts for their employees.
- The academic level of continuing education programming designed for engineers is Bachelor of Science or below.
- X • Industrial CEE programs discussed were more highly sophisticated than university programs from the standpoint of needs analysis, goal setting, program delivery, etc.
- X • The major multinational companies are spending large amounts of money on CEE activities.
- There doesn't seem to be a consistent definition of <u>engineer</u> that can be used when discussing different countries and thus one must be very careful in analyzing articles on CEE activities.
- In developing countries, government plays a major role in continuing education.
- The planning process for continuing education programs is basically the same worldwide.
- The experiences of France with a Continuing Education Law will be useful to us in the United States when legislating continuing education.
- Creative engineering can be taught on a national basis.
- From the Conference speakers:

  10-20% of each nation's engineers are involved in continuing education yearly.
  10-35$ is the range of cost per student hour, depending on format, location, etc.

- Various speakers broke up their cost per student hour into the following percents:

5- 7%	planning
11-15%	promotion
8-19%	materials
18-35%	instruction

III SESSION SUMMARIES

For each of the 16 sessions, one person was requested to be a summarizer/evaluator. Letters sent out before the Conference included these instructions:

> The summary should relate the major points of the discussion period. It is not our intent to have you act as a recorder, but rather to note the salient points, then write up the discussion so that a person not attending would benefit from reading your account.
>
> Observe these guidelines:
>
> a. Note specific instances of the practical value of the session.
>
> b. Data, projects, ideas, etc. presented, especially by non-U.S. participants/speakers, which are relevant for U.S. educators should be highlighted.
>
> c. Before writing your report, compare your notes with the appropriate case studies to bring out any common trends or relationships.
>
> d. Relate any differences between groups of countries in format, systems, projects, etc.

In addition, each person was requested to give his/her overall impression of the session.

Eleven of the summarizers/evaluators contributed a report on their session. Their papers are as submitted, with only minor editorial changes.

To assist the reader, an overview of the organization of the Conference is shown in Exhibit A.

EXHIBIT A

FIRST WORLD CONFERENCE ON CONTINUING ENGINEERING EDUCATION

TECHNICAL PROGRAM OVERVIEW

DATE	HOUR	EVENT
WEDNESDAY 25	9:00 a.m.	INAUGURATION OF CONFERENCE
	10:00 a.m.	FIRST PLENARY SESSION "The Super Industrial Revolution" Alvin Toffler (USA)
	11:00 a.m.	COFFEE BREAK
	11:30 a.m.	Panel Discussion with questions from the floor
	1:00 p.m.	LUNCH
	2:30 p.m.	SECOND PLENARY SESSION "Motivation in Adult Education" Dr. Bertrand Schwartz (FRANCE)
	4:00 p.m.	COFFEE BREAK
	4:30 p.m.	THIRD PLENARY SESSION "Education in Mexico in the year 2000" Dr. Roger Diaz de Cossio (MEXICO)
THURSDAY 26	8:30 a.m.	Session GROUP I "Professional Society Programs"
		Session GROUP II "University Programs"
		Session GROUP III "Industry/Government Programs"
	10:00 a.m.	COFFEE BREAK
	10:30 a.m.	SESSIONS (Continuation)
	12:30 p.m.	LUNCH
	2:30 p.m.	Session GROUP A - Needs
		Session GROUP B - Promotion
		Session GROUP C - Cost
		Session GROUP D - Staffing
		Session GROUP E - Evaluation
	3:30 p.m.	COFFEE BREAK
	4:00 p.m.	SESSIONS (Continuation)
FRIDAY 27	8:30 a.m.	Session GROUP I - Developing Countries
		Session GROUP II - Developed Countries
		Session GROUP III - Special Topics
	10:30 a.m.	COFFEE BREAK
	11:00 a.m.	SESSIONS (Continuation)
	12:30 p.m.	LUNCH
	2:30 p.m.	FOURTH PLENARY SESSION "The French Continuing Education Law" Gerard Le Roy (FRANCE)
	3:30 p.m.	"Developing a National Need Analysis" Dr. Samuel B. Gould (USA)
	4:30 p.m.	Panel Discussion
	5:00 p.m.	Closing Session

First Plenary Session

"The Super Industrial Revolution"

Speaker: Alvin Toffler

Mr. Toffler believes that a new future now emerging is making all our institutions and ideas obsolete. This presents enormous issues for all of us, but especially for engineers, scientists, and educators. In any period, education is part of a wider context. It is based on an image of the future, and that image is the critical component in education. It is the assumption from which all education begins. Today's education assumes that the present world industrial system will continue and will spread. But what we are seeing around the world today is the breakup of the world industrial system. Living in a revolutionary period, we must learn how to live in revolution.

This is not the first time that a world system has reached the end of its period. The first revolution that swept across the planet began with the invention of agriculture perhaps ten or more thousand years ago; this sent out a slow but powerful wave of change across the globe. Three hundred years ago the industrial revolution began, and that triggered a second wave of historic change across the planet. We are now feeling the impact of the third wave of historic change, which will produce a new civilization radically different from the several we now see on the planet.

The disintegration of industrial society does not, however, mean the death of science and technology. But the new society will be based on new forms of technology, the implications of which will help to create totally new social, economic, and political structures.

About one billion people live in industrial societies today. They represent one fourth of the world population and until now have dominated the other three fourths.

There are many underlying structures common to all industrial countries. All industrial societies are based on: (a) fossil fuels, (b) similar family structures, (c) big cities, (d) big governments, (e) big corporations, (f) large bureaucracies, (g) a nation-state system, (h) mass production, (i) mass distribution, (j) mass communication, and (k) mass education.

The mass education system in all industrial societies shares certain similarities. Each system requires of students: (a) punctuality, (b) obedience, and (c) rote and repetitive work. It is an education system designed to prepare students for their role in an industrial world. It is based on the assumption that the industrial world will have the same requirements when students grow up and enter the system.

Industrialism is deliberately referred to as a system. The energy, education, family, and technological structures are not random. They form elements of a coherent system. Mass communication interconnects with mass disbribution. Mass distribution interconnects with mass production. The family structure changes to adapt itself to a factory civilization. Together these elements form an integrated social system, but that integration is now collapsing. Parts of the system are changing at different rates of speed. The social, economic, and political synchronization is breaking down. This creates crisis situations in many of the subsystems such as energy, welfare, health delivery, and family structure.

In addition, external forces are impinging on the world industrial system. The three quarters of the planet's population that until now has provided subsidies to the industrial world in the form of cheap energy and raw materials are deciding they don't want to do that any more. The

combination of external forces and internal changes adds up to more than linear change; their result is a true world revolution triggering a third wave of change across the planet.

This third wave of change has three major characteristics that are different from the previous two waves. Perhaps the most important difference is the speed at which the change is happening. The agricultural revolution took thousands of years to spread across the planet. The industrial revolution took hundreds of years. The new revolution will take decades. This means a compression of change in the lifetime of the people living today. It means that new technologies will replace old ones at a faster and faster rate. It means that the rate of diffusion of technologies will be extremely rapid.

The second characteristic of the third wave involves the altering of the nature of the decisions that must be made. All decisions can be seen as either programmed or nonprogrammed—as routine or nonroutine. As the rate of change increases, fewer decisions will be programmable. And this goes not just for individuals but for political decision makers, policy makers in industry, and engineering designers.

The third characteristic involves standardization. Standardization is a very important part of any industrial process. We standardize not only products but also time, money, values, language, and people's lives. But the new wave of change moves in the opposite direction. New social groupings appear. Regional and sectional differences are emphasized.

All of this makes for a more complex environment, much more complex decision making, and much more difficult decision making. It raises the level of education, creativity, and resourcefulness required of ordinary people just to stay alive and well.

If all of this is so, it suggests a few things for education in general. First, not only must we know how to learn, but we must also know how to unlearn what is obsolete. Educational theorists talk about this a great deal but no one seems to know how to do it.

The industrial idea that young people could be given an injection of knowledge that would last a lifetime is absurd if the world changes. A lifelong education process must be integrated into the process of work, community action, and political struggle.

If we are moving away from standardization and toward diversity, this implies a need for far greater diversity in the curriculum. We also need to move toward greater individualization of the learning process.

A new technological and cultural age will give rise to a new epistemology. It means that Cartesian analysis, our highly developed skill of taking a problem apart and breaking it into its components, is no longer sufficient. We must move to a more integrated way of thinking. The new epistemology emphasizes not a single way of looking at a problem, but a multiplicity of ways. It says there may not be one solution but multiple solutions to any given problem.

The new epistemology has a new attitude toward nature. The industrial attitude held that nature existed for us to exploit. The new epistemology recognizes that we are part of nature and must develop more symbiotic relationships with it.

The new epistemology takes a different look at progress. The old idea of progress, so heavily tied up in engineering and technology, assumed that every step in technology was necessarily progressive.

Our attitudes toward evolution are changing. We must see ourselves as not just the products of evolution but as the designers of evolution.

Even our attitudes toward time begin to change. Time, which we thought was absolute and moving in a single direction, now turns out to be relative. Physicists talk about holes in our universe through which matter and energy may flow to another universe, and particles that may move faster than the speed of light and for whom time may move backward. The meaning of these hypotheses are unclear, but they force us to ask new questions about the reality we are trying to change.

In a society that is not changing very much, the people who know the most about the past also know the most about the future. In an industrializing society, the difference between past and present becomes noticeable, and the present begins to play a role in the curriculum. But in a world moving rapidly into the third wave, the curriculum of the future must, in large measure, be the future.

Questions and Answers

Mr. Toffler first responded to a question on the future of the factory, the family, and the university. He believes two factors will have major impact on the future of the factory: the extremely rapid development of communications, and the shift from a labor force primarily engaged in manipulating materials to a labor force in which many will manipulate only symbols. These factors will result in a movement of work out of the factory. Many people will work at home part-time, since communications equipment and computers will be cheaper than energy-intensive transport systems.

Regarding the family, Mr. Toffler indicated the industrial revolution led to a change from the multigenerational, large-household family, which was an economic production unit, to the nuclear family—husband, wife at home, and a few children. But now only 7 percent of families fit this

model. We are seeing the breakup of the nuclear family as the standardized family model. A proliferation of alternate structures is occurring; perhaps some of these will become dominant in the future.

The university is, in many ways, a preindustrial, feudal organization. In the future, universities will probably use more outside, part-time professors in order to keep up with the latest knowledge. More education will be done by nonacademic institutions.

Responding to a question on the future role of women in engineering, Mr. Toffler said the role structure is an excellent measure of change in a society. In industrial societies today, the role structure is being challenged, especially the roles of men and women. The nuclear family placed women in noninterdependent roles, which led to a stereotype of women as "subjective." Today, as more and more women enter the work force, that stereotype is changing. This will have a major cultural effect, including an impact on the job situation.

Regarding specialization, Mr. Toffler sees a shift from monospecialists to multispecialists — people who have successive specialties in different areas. Analogies are the essence of creativity, and someone who has moved through two specialties has two banks of data from which to draw analogies.

Mr. Toffler was asked about the role of the university in the developing countries. In many of these countries, the universities were modeled after the British, French, or American models and were not directed at the chief social, economic, and technological problems of the society. In the developing countries, and in the industrialized countries as well, the relationship between theory and practice needs to be changed; and that statement translates frequently into "We need to do practical work." In nonindustrial countries searching for a developing strategy, the work universities undertake in order to address the practical problems of the society must be of an essential, grass-roots character.

Mr. Toffler was asked if he saw further change following the third wave and if the change might be cyclical. Although he believes that cultures evolve and that subsequent changes will occur, he does not know what form they might take. The question of cyclical change raises profound philosophical issues. The Western model of linear time implies that cause must precede effect. Hence, if change is cyclical, progress is impossible. But cultures that believe in cyclical time view cause and effect differently. Mr. Toffler finds it very difficult to think in cyclical terms, and therefore doesn't believe we ever return to a starting point. He does believe, however, that a culture can move to a new set of conditions that resemble, in some ways, those of a preceding society.

Asked what he foresees for a country such as Mexico that is rapidly industrializing, Mr. Toffler confessed that he had certain fears about a country in this situation. The sudden influx of oil revenues into any country can produce a great deal of social and political instability. A strategy of industrialization means not only adopting new technologies but also a whole new cultural package. The effective redistribution of new economic wealth is another extremely difficult problem.

Regarding the future of religion, Mr. Toffler said the increasing diversity in high technology countries will lead to a diversification of religious views. People suffer when old social structures begin to break down. New religious sects and cults offering structure and a sense of belonging will be attractive to many people.

Responding to a question about the future of energy, Mr. Toffler said we are going to see a very rich energy system with many different kinds of energy harnessed in a thousand different ways. A national policy of substituting communications for transport will save a lot of energy. Also,

he observes that some of the most advanced technologies of today are less energy intensive. After this generation, he foresees a return to energy abundance.

Comments from Panel

Myron Tribus said the preceding lecture and discussion were designed to alarm us to action. The speaker is one of the better examples of a new establishment called the critiquing establishment. In order to gain attention in a world bent on other things, they are forced to use inflammatory language where ordinary language would suffice. Once we get over the shock of reading Future Shock, and turn our attention to what we ought to do here and now, we find we have much less help.

Dr. Tribus disagreed with several points made by the speaker. He characterized as an archaic view the idea that industrial society teaches and requires obedience. We need people who have a sense of autonomy and who know how to play on a team. He objected to the implication that standardization was bad. The purpose of a standard is to have people cooperate and not waste resources.

He asked that the audience, when reviewing the work of social critics, evaluate critically what is said.

Pierre LeGoff addressed his remarks less to Mr. Toffler's address than to the theme of the conference in general. He sees two issues of major philosophical importance in the future of continuous education. The first deals with freedom. He does not believe the rate of learning can be increased. But since the total amount of new knowledge is continually increasing, the relative amount of useful information will be reduced for each individual. Even if an individual devoted one half of his/her time to learning, the material to be learned would have to be

selected from the total pool of knowledge. But will the individual choose what is to be learned, or will someone else do the choosing? Freedom of choice is important.

The second issue involves the cost of learning. As the total amount of knowledge increases, the cost of learning will increase. But there is a limit beyond which the benefits of acquiring new information exceed the costs. Who then should make the decisions on the budgets for acquiring new information?

Paul Ortiz Ortiz pointed out the importance of our sudden feeling of being in an apocalyptic atmosphere. But this provides a rather pessimestic view for the future. If the well-being of individuals is used as the criterion of success, all past societies have failed. Even the Greek society was supported by slavery. In today's world, many people can subsist only by working in two or three jobs. How will they be able to handle future shock?

Final Remarks by Alvin Toffler

Mr. Toffler said that Myron Tribus and he had previously agreed that they disagreed. He rebutted the specific points raised by Dr. Tribus and pointed out that he has argued for technology, not against it. He has attacked stupid technology. He urged each member of the conference to become a member of the critical establishment, and said that we should be critical not only of what we are told but also of what we do.

Dr. George DePuy
Director, Technology Division
School of General Studies
SUNY-Binghamton
Binghamton, NY

Second Plenary Session

"Motivation in Adult Education"

Speaker: Dr. Bertrand Schwartz

Professor Schwartz spoke to the audience about some key ideas in developing continuing education programs. He pointed out that adults will participate in continuing education when the training provides specific answers to their problems, questions, and needs. Unless this condition is present, resistences will be encountered, such as: schooling is not for them, they won't be able to make use of what they learn, etc. He stressed that the mere availability of university courses is not sufficient to motivate people to participate.

To identify what continuing education people want, he uses the interview method. He cautioned that interviewers need to be trained to conduct interviews properly as well as to analyze their content. He cited three groups (nurses, foreign workers, and delinquent youths) where successful interviews culminated in high participation rates in continuing education. Schwartz uses different approaches in identifying problems and issues. One involves asking a direct question, "What problems are you encountering?"; a second technique involves group discussions as a means of developing a dialogue to identify problems and issues.

He concluded that people are willing to participate in continuing education once you respond to their needs. He stressed that educational programs should never be forced in a group without first using a needs assessment approach.

Dr. Samuel S. Dubin
Professor of Psychology
The Pennsylvania State University
Department of Planning Studies
215 Grange Building
University Park, PA

On Thursday, April 26, three concurrent sessions were held in the morning. Session I explored programming in professional societies. University programs were the topic of the second session. Session III contained papers on programs in industry and government.

Session I

"Professional Society Programs"

Four papers were presented in this session: "A National Program," Lasse Kivikko; "The 3-D Program," Niels Krebs Ovesen; "The Law on Continuing and Permanent Education of Engineers and Technicians in the Ivory Coast," Jean Jonas Adou; "A Traveling Road Show Concept for Continuing Education," George Armitage.

1) FINLAND: A NATIONAL PROGRAM

Speaker: LASSE KIVIKKO

Continuing engineering education is totally accepted in Finland by both the educational and industrial communities. A national organization, INSKO, was chartered to provide administrative and technical expertise to the sponsorship of continuing engineering education.

The organization focuses primarily on technical courses, although management programs are increasing in popularity. The average engineer in Finland spends four days per year at technical and nontechnical courses. Employer-sponsored programs account for 50 percent of the total course offerings. INSKO, universities, and other groups account for the remaining program offerings.

INSKO will sponsor approximately 305 courses per year. Management courses will account for 29 percent of the total, civil engineering 22 percent, electrical engineering 20 percent, mechanical engineering 11 percent, and process technology 18 percent.

In Finland, technical education is considered an investment, not an expense. Formal education is needed to fill predetermined needs. Continuing education is needed to fill the void of unknown and random needs.

2) DENMARK: THE 3-D PROGRAM

Speaker: NIELS KREBS OVESEN

Continuing engineering education in Denmark is the responsibility of an umbrella organization, D.I.E.U. It provides high-quality programs available to all practitioners.

Program needs analysis is accomplished by consultation with project groups. These groups are frequently reorganized to provide vitality and current ideas in technology.

Promotion literature, costs, fees, and honorariums generally reflect the experiences with U.S. continuing education programs.

3) IVORY COAST: CONTINUING EDUCATION LAW

Speaker: JEAN JONAS ADOU

Mr. Adou reviewed the national policy on continuing and permanent education. The Ivory Coast has instituted a tax on employers to generate monies. This law is patterned after the French Law.

4) CANADA: IEEE PROGRAMS

Speaker: GEORGE ARMITAGE

Mr. Armitage generally focused on the scope of the IEEE programs in Canada. Promotion, costs, course development, and honorariums were discussed. In addition, the close relationship with IEEE/U.S. was also discussed.

Stanley M. Greenwald
Executive Secretary
State Board for Engineering
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99 Washington Ave.
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Session III

"Industrial/Government Programs"

If anything can be derived from this session of the conference, it is that there must be an interest and a commitment on the part of industrial management or government if a continuing education program is to be a success. In addition, there also must be certain commitment and interest on the part of the students. This common thread was presented in each of the papers that described the programs of the individual companies. Among the programs presented by Mr. F. B. Donalson of NL Industries; Dr. Lindon Saline of General Electric; Prof. Antonio Necoichea, Director General of the Federal Delegation of the Secretary of Commerce of Mexico; and Dr. Ernst Golling, Siemens AG, the only difference was the method by which the education was accomplished. Some of the same conditions for education were also identified in the case studies that were included as part of the preprinted papers. These included papers from Westinghouse Electric, Bell Laboratories, IBM, and the Bell System Center for Technical Education.

Mr. F. B. Donalson of NL Industries[1] described NL Industries' training program, which is based on a total systems concept. The training used to be the conventional classroom type; it has now been changed to an individualized system based on modules. The training is mainly focused on practical applications, and includes some career planning and supervisory and management skills development. All the training is based on skills building and simulation of performance on the job. The subject material does not vary; students always know exactly what they must accomplish and the time in which they are expected to accomplish it. Modules are updated continually to include new material and new technologies.

The NL Industries' program is being conducted in Houston at a new training facility on an 86-acre site that includes living facilities as well as training areas. Courses are written and conducted in several languages, since employees are brought to the center from around the world. The purpose of modularizing the training is to provide training in technology by defining the job and obtaining agreement on what the job is; then the instruction just falls into place. Originally developed by instructors, modules are now written by technical writers. After the modules have been defined and developed, the media in which they will be presented is then defined. The yearly budget for training in 1979 was approximately $2.3 million.

The General Electric philosophy[2] is one of "Grow your own professionals." Most managers have been with GE a long time, as is exhibited by the low turnover. The career path is determined at a very early age of employment. The philosophy is to adapt new engineers to the GE methodology. GE feels that education and professional development are a lifelong process, assisting an individual in moving forward along a career path and in achieving company objectives.

Professional development depends on each individual and his/her environment. The professional development program depends on creative work assignments, coaching and supervision by competent managers, and related education activities. The latter include graduate studies and an in-house program called the "A" course. One university gives nine hours of credit for completion of GE's "A" course. An individual may complete other courses or go to the university for a master's degree. The purpose of this related education activity is to sharpen an individual's skills in defining problems, selecting proper solutions, and

presenting conclusions concisely. The program is designed to define jobs that will enable an engineer to function effectively in GE with some sense of accomplishment.

While GE finds that engineering graduates are strong in theory, have a good attitude for hard work, and have excellent computer skills, they generally are limited in the areas of communications and practical problem solving (that is, being able to define ambiguous situations that have multiple answers). The one special program that GE has is its Edison Engineering Program. This program is only open to outstanding engineers in scholarship and leadership. It builds on the strengths that were developed on campus and increases the engineer's breadth and depth of technical and business understanding. This program is used to develop GE managers of the future. The individual needs of the engineer are determined and a career track arrived at from experience within GE and by interaction with the universities.

The only area that GE feels needs to be improved is that of communications, both oral and written. Engineers are generally poorly equipped to write reports. There is also need for undergraduate attention to the impact of computers and graphics and how engineers can be made to think with these tools. Academics for academic achievement is not always as important in the selection of engineers for GE as people interaction, which is especially necessary for engineers who are to become manufacturing supervisors. Engineers need more training in problem solving.

In many respects, the Siemens experience[3] in professional development is similar to that of General Electric. Both have similar structures in their training. The initiative for training originally must come from the employee. The supervisors are responsible for training. Most courses

are on an in-house basis because the training is not available at the university.

All the programs are planned in advance. The supervisors and instructors are carefully selected and the best media is selected for presentation of the courses. All expenses are borne by the company. At Siemens, the product groups are responsible for developing and implementing educational programs in various product-oriented subjects. This product training, which is carried out by the groups at their respective locations, constitutes the largest sector in the continuing engineering education program. In this respect, the practical aspects of engineering education is emphasized similarly to that of General Electric and NL Industries.

The only paper in this session that presented government continuing education activities was the paper presented by Prof. Antonio Necolchea.[4] This program was not in the area of engineering, but in agriculture. Its concern was the training of farmers. While it was outside the area of this particular meeting, this agrarian training program did have similarities to that of the continuing engineering education program inasmuch as the program has a practical orientation in developing productive skills. Also, training is done in a central facility that is away from the normal work area, providing an academic situation conducive to training. Modern audiovisual aids and teaching methods are emphasized for greater ease of understanding and learning.

The training the farmers receive under this program is reinforced, when they go back to their farms, through correspondence courses that also provide a vehicle for communications with the government. In many respects, this program keeps the training consistent with the particular

needs and circumstances of each country or region from which the students come. In this respect it is like the Siemens program, which is international in scope and, therefore, serves the needs of a particular country in which the employees are assigned.

Dr. Marcos Kaplan of the University of Mexico commented that political problems influence continuing education in Latin America quite severely. In many cases, scientists are subjected to persecution. He felt that greater cooperation from all nations is needed in the areas of science and technology.

The case studies that supplemented the formal paper sessions were in many respects similar to the programs that were presented in the papers. For example, the Westinghouse approach[5] to continuing education in one plant was to develop a modularized microprocessor course which would satisfy several needs: to inform the managers and the support personnel through an overview of the subject, and to progress in further modules into greater detail. In many respects the microprocessor training course is similar to the modularized training programs used by NL Industries. They provide an overview course for managers and upper-level personnel, followed by more detailed courses in basics for engineers and engineering managers. Then this is followed by another module for designers and a more fundamental course of a hands-on variety for technicians who will be supporting the engineering designers. This modularized program is conducted in conjunction with North Carolina State University, which provides the professors for the module on basic electronics and logic design.

In the continuing education program at Bell Laboratories in Holmdel, New Jersey,[6] most instruction is by traditional instructor-led lectures.

However, they also include various media, and self-paced individualized learning is being used on an increasing basis. This self-paced study is similar to the self-paced instruction used by NL Industries. The continuing education staff is comprised largely of Bell Labs personnel, augmented by university faculty members in a ratio of about 1 to 5. This is similar to the approach that Westinghouse used in setting up its microprocessing curriculum. The entire program is based on a needs analysis in order to fulfill identified deficiencies or areas of expertise for satisfying future needs. Bell Labs experiences a very high retention rate in enrollment; inasmuch as enrollment is voluntary, this is a measure of the degree to which the participants' needs are being satisfied.

In the IBM paper,[7] the case presented is a four-week program called "Update '7X." This four-week program is to satisfy the need for a means of updating experienced engineers whose careers have become specialized. The program is structured to relate to both IBM business and individual concerns. IBM, in the same manner as Bell Labs, uses professors from surrounding universities as well as in-house personnel to provide the course instruction. This four-week course is conducted away from the company at the University of California, Santa Cruz campus. Taking the participant away from the normal business environment helps to reinforce the learning process. Taking the personnel away from their work environment is similar to the approach taken by NL Industries in its program and by Mexico in its farmer-training program. The update program by IBM is not the only program that IBM has in its continuing education program. A large spectrum of other courses and programs are offered on a continuing basis.

The final case[8] to be considered is that of the Bell Systems Center for Technical Education in Lisle, Illinois. The objective at this Center is to provide educational support for the Bell System's objective of providing quality communication services at low cost. Therefore, concentration is mainly on technical management training. In that way, personnel can be trained to be responsive to customers' needs and the company business. The formatting of the program is similar to the approach taken by both NL Industries and Siemens, in that they are providing continuing education to their personnel in order to increase technical knowledge of the company products. Their personnel are then better equipped to handle customer problems, difficulties, and other matters in the field and on the job. The Lisle Center staff feels that their program not only prevents obsolescence of their engineers but is also essential to the survival of the company itself.

This brief summary of the papers that were presented, and their correlation to the case studies, is mainly involved with industrial applications to continuing education. There was little to be heard about the governmental aspects of continuing engineering education. However, in some of the other sessions the viewpoints of other countries were heard concerning their attitudes and approaches to continuing education. In this regard, I would like to include some of the comments, questions, and answers that were presented by members of foreign countries during these later sessions.

In most of the foregoing, the companies identified their needs and then went about developing a training program to satisfy those needs. The individual countries look at their continuing education needs differently. Dr. Myron Chin (West Indies) stated in his summarization of

one of the sessions that there was no single, good method for determining needs of engineers. The method used should be one that is most applicable to the country involved. In developing countries, national goals define the needs of engineers, and necessary steps must be taken to equip engineers for achievement of national goals. In developed countries, universities, industry, and government use different methods of satisfying needs. No unique method can be found. There is a multiplicity of methods used by industry and government, and they use the methods that suit the needs in the best way. There is no standard quantification method for determining needs. Only Finland has used the Delphi statistical method for identifying needs. As goals change from time to time, any method used must be dynamic to suit the needs of changing country requirements.

As a recommendation for the group, the group recognized that there are many methods of needs analysis used by different groups and that the needs analysis should include the need of the individual; the professional society and university needs should be secondary. While company interests are sometimes included as being first in priority, the consensus was that this is the wrong way; company needs should be secondary or tertiary to individual needs. It was felt that urgent need exists to develop methods of predicting future needs of engineers and technicians, and that perhaps studies in different countries on prediction and success of studies is needed. Finland differentiates needs from objectives and, in some cases, we get involved in a semantics discussion on the differences between these two.

One participant from Mexico commented that there is a strong emphasis in the United States on training and knowledge. There is strong support

from industry to satisfy the diversified needs in the United States. However, in Monterey, Mexico, which is a mountainous area, diverse courses are needed because many of the engineers are outdated and are being replaced by young engineers who know such subjects as microprocessors. International engineers who work in these remote areas and in small industries often request universities to provide courses. Mexico is trying to adapt U.S. experience to its needs at the local level.

Myron Chin also expressed the need for solving problems of educating engineers working in small islands in the West Indies. One course felt to be needed is construction management. However, it is difficult to make this available to all engineers because of the remoteness of some of the island areas; additionally, international assistance in funding particular courses is needed. One course in construction and project management is being held in Barbados and in Jamaica, and engineers from remote islands will be asked to attend.

A participant from the University of Wisconsin stated that while small countries have problems with providing continuing education to remote areas, the United States has the same kind of problems in a different way. The participant currently has a $50,000 grant to study the needs of engineers in small, widely dispersed companies in Wisconsin. This fact illustrates that small countries are not alone in servicing remote areas. Seventy five percent of the courses given in Wisconsin are in geographical areas having large companies. Madison, Wisconsin is an example. Some engineers have an education that is 20 years old; we need to update this education whether they are in populated areas or in remote areas. Therefore, the United States does have problems

similar to the problems of small countries in serving the needs of engineers in remote areas.

In Russia the engineering education programs are well developed, consisting of correspondence courses and short courses. Russia has a large continuing education network, and all programs are fully subsidized. There are 90 branches of continuing education courses on a full-time or part-time basis, and these can be either regular courses or correspondence courses. High-level management programs are also given. Russia plans its educational programs very thoroughly. These plans, based on economic development and economic planning, state how many engineers should be educated in specific fields. This planning is done by both state and federal agencies. Russia does use multimedia in order to service remote areas. One television channel is used exclusively for basic education, but nothing exists to date for continuing engineering education.

Vladimir Yackovlev, Vice President of INETET, Venezuela, presented the national program for the oil and petrochemical industries in Venezuela. Mr. Yackovlev stated that the continuing engineering education program includes all the people in the petroleum industry. However, there is an immediate need for updating the training of technicians and engineers. In 1978, 600 courses were offered for managers, technicians and supervisors, and training courses for technicians.

One question asked of Mr. Yackovlev was how they were able to grow so fast in their programs, as it must have required a large number of instructors. The answer is that they "grow their own," in one respect. The needs for continuing education are based on industry needs. Instructors are borrowed from industry; later these instructors transfer to the program

on a full-time basis. The INETET, an autonomous private institution, includes representatives from each of five companies and a labor union. The salary scale for instruction is the same as for the oil industry; therefore, the program can attract instructors.

Dr. Bernard Hauser, Minister of Industry for France, presented the French program, which is governed by the French Continuing Education Law. This law forms an agreement between employees and employers and recognizes the usefulness for all workers and employees of continuing their training and education. The law, which went into effect July 15, 1971, encourages continuing education, but it has definitely not solved all the problems in this area. The law provides an individual with the right to continuing education. It is for all the workers, not just engineers. There are certain requirements of longevity in order to be eligible for the program. The law permits two percent of the workers in a company to be involved in continuing education if the company has over 200 employees. If the number of workers in continuing education falls under two percent, the company cannot refuse an employee's request for training. The employees do not have to follow the company's wishes for the direction of continuing education. If the employee and the company cannot agree on training, the government can arbitrate such conflicts. Employees may also ask for leave of absence if the training is outside the company's interests. France is still gaining experience in the application of this continuing education law.

In summary, I would say that there is no clear consensus among the participants as to the approach to continuing education in industry and government. Many of the third world nations, because of their growing political force and nationalism, feel that the greatest need for continuing

education is one that satisfies the national need. Much of this comes from the impact of countries that have new resources such as oil; such countries may have, therefore, very critical needs to satisfy the problems created by these new resources. There are not only national needs but also needs of the government and the environment. These needs are similar to the industrial needs in that they are satisfying current practical problems.

I assume that if there was any one consensus between company and government, it would be that there is a need for solutions to practical everyday problems and, therefore, that education should be focused in this direction. This attitude is in opposition to others that place the individual needs of the engineers paramount, over and above the company interests.

Another factor considered was the means of presenting the information. There is no commonality of presentation. Many people in companies and governments try various multimedia methods with varying success. One common method in course instruction involves taking the students away from the work environment into an instructional environment and thereby removing them from the concerns of the everyday work life. It seems that this method is becoming more and more prevalent. While having some attributes, this method is not completely satisfactory if you consider that the person is unavailable to the company during this period of instruction.

If there was one element of agreement, it was that a continuing need exists for dialog on methods for determining needs and conducting continuing engineering education courses.

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(2) "Bridging the Academic-Industrial Gap: GE's Entry-Level Process," G. H. Hupman and L. E. Saline, General Electric Company.

(3) "Facts and Figures on Continuing Education for Siemens AG Engineers," Dr. E. Golling, Siemens AG, West Germany.

(4) "Continuing Education in Agricultural Programs: Training for the Agricultural Population of Mexico," A. M. Necoichea, Federal Delegation of the Secretary of Commerce of Mexico.

(5) "A Case Study on a Successful Industry-University Solution to a Continuing Engineering Education Program," J. R. Van Horn and E. C. Benbow, Westinghouse Electric Corporation.

(6) "Continuing Education in a Large Telecommunications Research and Development Establishment," C. R. Wischmeyer, Bell Laboratories.

(7) "Update '7X: A Balance of Problem Solving and Technical Perspective for Experienced Engineers," G. L. Pastre, IBM General Products Division.

(8) "The Role of Training in Corporate Survival," C. J. Sener, Bell Systems Center for Technical Education.

During the afternoon of April 26, five concurrent discussion groups were held. Each group had a moderator who, after introductory remarks, initiated a discussion on the assigned topic. The five groups were on needs analysis, promotion, costs, staffing, and evaluation.

DISCUSSION GROUP A

NEEDS ANALYSIS

The moderator for this session, Dr. Myron Chin, opened the discussion by outlining some of the methods of needs analysis. Direct personal communication with working engineers, industry, and professional societies was cited as a primary avenue. Survey questionnaires are often used as a vehicle, either to obtain an indication of interest or to evaluate a course at the conclusion of continuing education programs. Advisory groups within professional societies and industry evaluating its own needs were other methods mentioned.

Very early during the discussion period, it became clear that demand analysis is more important than needs analysis for planning continuing education programs successfully. Dr. Samuel Dubin of Penn State indicated that professional engineers will often express a desire for certain courses in the planning stages, but when the courses are actually offered the numbers tend to disappear. Dr. Dubin related the case of a Solid Waste Management course for which a questionnaire was very carefully designed. The question was placed as "How many from your company will take such a seminar?" rather than "Would you be interested in taking such a seminar?" Thus, demand analysis coupled with needs analysis would provide numbers far more meaningful and useful for the successful planning of a course. This was regarded to be a specific instance of the practical value of the session.

A quantitative method of needs analysis that utilizes the Delphi method was discussed. This method was used in Finland with a high degree of success. Elsewhere in the proceedings of the conference, H. T. Laine

described in detail the structure of continuing education in Finland. His paper, "Finland: A National Program," examined the Engineering Organizations' Continuing Education Center, which serves as the central clearinghouse. The Center provides about 50 percent of all technical continuing education in the country. A very important part of the Center's operation is policymaking; policy is made by representatives of the four organizations and, in the final analysis, by the people who attend the courses.

This workshop on needs analysis was attended by several individuals from private companies that provide training services to industry as well as to individual scientists and engineers. The perspective of these training service companies was an important contribution to the workshop, since these companies have to rely on a very careful needs analysis for their successful operation. From their perspective, needs analysis was categorized in three types: (1) the individual or personal type, which is rather subjective and incomplete; (2) the organizational type of analysis, which considers the individual as part of the organization; and (3) analysis from the viewpoint of the professional society, with the possible objective of recertification. The individual engineer will emphasize career development. The engineering manager will emphasize performance appraisal combined with career development, while the professional society will consider retraining the older engineer by offering intensive courses. It was pointed out that the organizational priorities need to be tempered with a consideration of the personal needs of the engineers.

In developing countries, the participation of practicing engineers in continuing education programs was noted to be inadequate. The case

was made especially for India, where the government is the single largest employer of engineers. Financial and other support is not as readily available as it is in developed countries; consequently the practicing engineer is not provided with the appropriate motivation to seek continuing education courses.

It is clear, then, that in developing countries the government has to play a central role in determining the needs of the engineering community both from an immediate future perspective and for the long-range planning needs of the country. Certification and recertification of engineers becomes, then, a relevant vehicle of continuing education in a developing country. Dr. Ingersoll pointed out that highly developed engineering communities such as California are tending to move away from certification. The majority of such engineers, especially in the electronic, electrical, and computer disciplines, regard certification as an unnecessary imposition of an additional hierarchical structure. Dr. Jordanides pointed out that the diversity of engineering practice in California and elsewhere in the United States is such that the role of engineering societies or any other governmental body in certification would become fairly difficult.

Finally, some questions for future examination were thought out. Does the role of continuing education lie more in skill training than in technical education? The quick delivery of important technological ideas through continuing education is a noted advantage compared to the slowness of the traditional academic programs. Thus, continuing education can lead the thrust of engineering education for the future. The feeling here is that continuing education can act as an important catalyst within the traditional university programs. The short-term horizon of continuing

education can complement the long-time constants necessary for academic approvals within the university. As an example, it was indicated that a very successful and popular senior elective course on Microprocessors was started three years ago as a continuing education experiment by the Electrical Engineering Department of California State University, Long Beach. In a fast-changing technological world, continuing education properly planned and delivered will provide direction and will coexist in harmony as part of the main mission of a university.

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DISCUSSION GROUP B

PROMOTION TECHNIQUES

Promotion in continuing education programs was the topic of a discussion group moderated by Dr. Sabah Al-Nassri (Iraq). Dr. Al-Nassri opened the discussion by expressing a concern for cost-effectiveness in planning. Even the best planned course needs promotion. Promotion is necessary in the marketing decisions of product, price, place, and promotion. Its role is one of persuasive communication, that is, presenting messages to a target audience in order to create interest or desire for the product. Continuing education programs are products, and the main tools of promoting these products fall into the categories of advertising, publicity, and personal contact.

Advertising is a technique used in most of the countries represented in the discussion. Participants agreed that direct mail advertising is generally the most effective. In countries other than the United States, mailing charges are very high. Therefore, direct mail must be selective and to a specialized audience.

More brochures are sent by organizations in the United States than by organizations in other countries. However, with so many institutions offering continuing education courses, some of this mailing is institutional advertising, that is, keeping the organization in the public's eye. In every country past participants provide an excellent source of names used for mailing. As a group, countries outside the United States seem to place greater emphasis on mailing to and contacting training managers. In Iraq, courses at the University of Technology are planned in cooperation with employers and employees. When the courses are offered, employers

are informed through meetings and calls, while advertisements in newspapers and journals attract employees.

No representatives from companies were included in the discussion group; promotion of company courses, if necessary, is an internal affair accomplished by newsletters. Professional societies promote their programs, however, by placing ads in their own magazines or newspapers. Universities tend not to place paid advertising in magazine or newspapers. Only universities in Mexico and Iraq use this form of advertising. Universities and professional societies with a small population of engineering personnel to draw upon use cover letters with their brochures. They have found this added touch to be more effective. Courses in India are also advertized, but different problems prevail. The majority of continuing engineering education programs are for engineering teachers, although engineers in industry may attend. Prospective attendees are invited to submit a proposal; these proposals are screened and attendees are selected. Those programs offered for engineers in industry are advertized by means of a letter and a brochure describing the course.

Discussion group members agreed that effective advertising cannot save an ill-designed course, but ineffective advertising can harm a well-designed course.

Publicity, as opposed to advertising, is not paid for, but is news coverage in the press. Professional society journals and trade publications will often run course announcements in a calendar listing or might even devote a brief article to a course of particular interest. Most group members tended to believe that publicity is not that important as a means of promotion.

Personal contact, while time consuming, is believed to be an effective means of promotion. In the United States, personal contact for promotion is done informally. Speakers at university programs might promote the program within their company; program directors who work with industry in determining needs also contact key people in industry when a course is offered. Most other countries place a greater effort on working with directors and managers in course planning and on contacting them when the course is offered. Since mailing costs are high in the United Kingdom, contact is maintained with training managers. Disseminating course information through these managers is very effective. In companies, managers who assisted in determining course needs are then contacted when the course is offered.

Everyone in the discussion group agreed that a quality program is in itself an excellent promotional tool. An engineer who comes to a course that satisfies his/her needs will recommend to a colleague both the course and, at least implicitly, the institution offering the course. A good reputation speaks for itself.

In the USSR, promotion is not considered in continuing education programming. In a planned economy, education is also planned. The state determines who attends continuing education courses.

Speakers from developing countries spoke of the need to instill an attitude of lifelong learning in engineers and technicians. This attitude, they believed, would make promotion a minor ingredient in overall course planning.

No new techniques for promoting continuing education programs were brought out in the discussion. All countries have the same range of techniques, but emphasis on particular ones varies. Everyone agreed

that directing promotion to past participants is an excellent strategy. Brochure mailing was the most-used form of promotion, with countries other than the United States sending smaller quantities to a more specialized group. If universities and professional societies in the United States find direct mail costs becoming excessive, they might do well to follow the lead of smaller countries by being more selective in mailings, and by working more closely with training directors and with specific industries.

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DISCUSSION GROUP D

STAFFING REQUIREMENTS FOR CONTINUING EDUCATION PROGRAMS

Early in the discussion on staffing requirements for continuing education programs, it was apparent that there were no quick or easy solutions to the problem. Participants represented institutions that were in varying stages of development of their outreach programs. Furthermore, institutional representatives were from countries in varying stages of development and commitment to education and educational outreach.

Continuing Education Objectives

In view of the diversity in experience, institutional development, and commitment, discussion centered around the objectives of continuing education for engineers. It was generally agreed that programs should be designed to:

1. improve professional competence,
2. provide management training, and
3. address sociopolitical changes and cultural needs.

Staffing Model

To accomplish these objectives, ideally an institution should organize a separate multidisciplinary unit of continuing education. Preferably, the unit should be staffed by individuals with training and experience in developing educational programs and providing instruction for working adults. A background of training and experience in engineering would be helpful. To paraphrase Bertrand Schwartz of France, adults want instructors to recognize that they have knowledge. They want instruction that will help to solve immediate problems and to

increase their productivity. As continuing educators, we must reflect on our own experience and learn how others perceive us.

The continuing education staff must be able to involve faculty from many departments and disciplines of their institution as well as from other institutions and experts from the field if the objectives are to be realized. In addition, they must keep in constant contact with the community and particularly with the professionals in the field to assure that programs and activities are relevant to current needs and issues.

Staffing in Developing Institutions

In developing institutions, financial consideration may require that an existing faculty or staff member be assigned the responsibility for organizing the continuing education function. If this alternative is adopted as the course of action, the group agreed that (1) the individual assigned this responsibility should be a senior faculty or staff member recognized by his/her peers and the professional community as having the ability to perform the function, (2) he/she must be relieved of enough of his/her normal duties to have time to devote to his/her new assignments, (3) he/she must have the full support of institutional and departmental administrators, (4) he/she must be provided secretarial and other staff support, and (5) initially he/she must have the necessary financial support to get the program started.

Cooperation of Others Essential

It was generally recognized by those attending the session on staffing that integral to the success of any continuing education unit is the cooperation and participation of two groups: (1) the teaching and research faculty and staff of the institution; and (2) advisory groups composed of members from various school/departments of the

institution, and from the community, professional associations, and industry. The first group should be the major source of instructors for continuing education programs. In addition, these individuals should be a major resource for continuing education program ideas. Advisory groups can serve the function of keeping the continuing education staff informed of the educational needs of the groups they represent, while keeping members of their groups informed of the continuing education programs, activities, and services available from the institution. They can also serve the important function of building community and institutional support for the continuing education unit and its programs.

Financing

No discussion on staffing would be complete without consideration of financing, and this group's discussion proved no exception. As in the section on staffing, no specific guidelines are offered because needs and situations differ. However, the consensus was that to start a program, institutional funds must be made available for the employment of a small staff of administrators to organize the unit and develop its programs. As programs grow and as the unit becomes established, income generated from program fees should be sufficient to pay program expenses, including any increases in staff to plan and manage the programs. Any excess income generated should be available to the continuing education staff for use in researching needs for new programs and for planning, developing, and implementing programs to meet new needs.

Summary

Because situations and needs differ, no specific guidelines for staffing are offered. The continuing education program unit must be

alert to the needs of the community. It must have the flexibility to plan programs to meet the continuing education needs of its clientele. This requires that the unit be broad based, with access to instructors in many disciplines. The staff must have an understanding of the employed adult as a learner, so that programs and instruction are designed to satisfy the clientele's specific needs. The staff must have the support of administrators, from the department head to the head of the institution. Staff members must develop strategies for staying in constant contact with the community, so that they are aware of the educational needs of the people they are supposed to serve. Instructors should be drawn from departments within the institution, from other institutions, or from professionals in the field. A quality, broad-based program properly managed will build support for the unit and the institution which it represents.

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DISCUSSION GROUP E

EVALUATION

At this workshop moderated by Charles Sener (USA), a major difficulty in evaluating continuing education programs was pointed out in the paper by Alfonso Henriquez de Brito (Cidade Universitaria, Brazil). In any education program there are at least three distinct groups: those who teach, those who learn, and those who pay the bill. Difficulties arise because the motivations and objectives of each group are not necessarily the same. Consequently, their criteria for evaluation are apt to differ.

Teachers evaluate student learning by exams, which could well include completion of realistic projects. Though they realize that the efficacy of what is learned depends on how it is applied, they are not in a position to follow up on the students. Questionnaires on their own performance are perforce based on students' short-term perceptions and tend to reflect more on the manner of presentation and on the students' immediate expectations.

The students' objectives depend on whether they are adult learners or youth. The latter, as the paper by Myron Tribus (USA) put it, make a compact to learn, to seek knowledge. They have time to study general broad principles, the application of which is not always immediate. Adult learners with family, civic, and job responsibilities place a high value on time and on learning skills that will enable them, fairly rapidly, to enhance their employment opportunities. They will tend to evaluate their own learning, and instructor performance, in the light of these needs.

Although the student is the consumer, the customer, typically the student's employer, is the one who pays the bill, and he who pays the piper calls the tune. Thus, major importance in evaluating student learning should be given to the employer's criteria, and these differ even in the same organization.

Professional organizations, to cite another group, may regard the objective of continuing education to be the recertification of their members. However, as several discussants noted, there are presently no general standards for evaluating units of continuing education. Others maintained that the objective of continuing education for adult learners should be to keep their skills current or to enhance them, and should not be to get a new degree or obtain recertification of an old one.

Some discussants from Latin American countries, particularly where some arm of government is the employer, felt strongly that evaluation of a program should be based on the extent of its contribution to societal needs. They felt that in countries with limited resources the content of continuing education programs should be directed strongly to meeting the more urgent needs. There was no disagreement with this. However, there was some inability to translate these sentiments into criteria by which such programs could be quantitatively evaluated.

The criterion enunciated by industrial employers for evaluation of student learning is simple: it should produce results. How to measure these results, let alone how to define what a result is, led to much discussion. The result that stockholders seek is increased profits. Though specific in one sense, it is too diffuse to be applicable to evaluation of student learning.

One suggestion was that student learning be evaluated strictly in terms of how much more efficiently the employee performed on the job. This suggestion had its problems, however: While some jobs are amenable to simple quantitative measurements--how many lines of computer code are written, how may units are processed, how fast an assembly is completed--other jobs cannot be so readily measured and standards of different supervisors vary. Furthermore, should improvements in employee performance be measured on a short-term (a few months to a year) or a long-term (two or more years) basis? What is the return on investment of an employee who is promoted into a management position that does not need the skills so recently acquired or refreshed?

Papers by Wischmeyer (Bell Labs, USA), Saline (GE, USA), Kachhara (India), and Prapinmongkolkarn (Chulalongkorn University, Thailand), placed considerable emphasis on evaluation by feedback--formal, through opinion surveys, or anecdotal, from instructors, learners, and their immediate supervisors. Such evaluation, whether of student learning or instructor performance, would provide indicators of trend, necessarily to be assessed over extended periods.

The paper by Donalson (NL Industries, USA) espoused the philosophy that to be effective, a company training program should be continuous and should be controlled at the job site as well as in the classroom. This viewpoint found support in the paper by Sener (Bell System, USA), who believes that training programs must provide employees the knowledge they need, when they need it, and no more than they need, and that this is achieved by continuing close consultation between instructors and management at every step of the program and after the employee returns to the job. By including potential students in this process, particularly

with respect to defining course objectives, developing schedules for completion, and using student feedback in a continual program restructuring, one program that involved almost total reeducation of engineering staff from an electromechanical to a solid state technology proved very successful. This case was described in a paper by Van Horn and Benbow (Westinghouse, USA).

This sparked the suggestion that regardless of the nature of the education program--arts, technology, interpersonal relations--or the level, the best criteria for fair evaluation would be for each of the distinct groups--teachers, learners, and employers who paid the bill--to state specifically the objectives they expected a successful completion of the program would achieve. These objectives, meeting the needs of all groups, should reflect a consensus achieved by close consultation. Once a specific set of objectives for a given program is obtained, an evaluation survey or questionnaire should be prepared in advance so that all groups involved will be aware of the criteria by which the achievement of the stated objectives are to be measured. Finally, the evaluation should be undertaken only along these lines.

The discussants in this workshop felt that such a procedure for evaluating continuing education programs, if consistently and fairly applied, would go a long way toward providing a fair assessment of their success. In general, participants from Latin American countries appeared to feel strongly that societal needs should play a significant role in determining the selection of participants, the content of programs, and the process of evaluation for continuing engineering education programs. The views of U.S. participants seemed to be directed more towards addressing such programs to the needs of industry and evaluating

them primarily, if not solely, by measuring improvements in the employee's subsequent contributions to the job. These differences in philosophy may be attributable to differences in extent of industrialization and socioeconomic systems, as well as differences in sensitivity to societal needs and expectations, in the participants' countries.

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On Friday, April 27, three concurrent morning sessions explored special programs in continuing education. Group I had speakers from developing countries. The speakers from Group II discussed programs in more advanced countries. Various special projects were the topic of Group III.

CONTINUING EDUCATION PROGRAMS

The Group II Session provided an interesting mix of papers and an unusual opportunity for interchange of ideas. Two speakers from U.S. universities and two from governmental agencies (New Zealand and Mexico) were responsible for topics on continuing engineering education. Since printed copies of the papers were available prior to the session, most authors used the opportunity to expand on their printed material. The discussion after each speaker's presentation was most informative. This very effective approach enabled speakers and participants to use most efficiently the time available to them.

The Group II Session speakers were (in order of appearance):

Name and Affiliation	Title of Paper
Mr. Robert G. Norman Assistant Commissioner of Works Ministry of Works and Development Wellington, New Zealand	Continuing Engineering Education--A New Zealand Viewpoint
Dr. E. T. Cranch, President Worchester Polytechnic Institute Worchester, MA	An Undergraduate Program Designed for Lifelong Learning
Ing. Francisco A. Beltran Ilizaliturri S.A.H.O.P. Sub Secretaria of Public Works of Mexico	The Continuing Education in the Secretariat of Human Settlements and Public Works of Mexico
Dr. James L. Rogers, Director Instructional Television Network Case Western Reserve University Cleveland, OH	A Bilingual Videotaped Technical Training Program

Mr. Norton (New Zealand) and Mr. Beltran (Mexico) dealt with the more traditional aspect of continuing engineering education, that of updating practicing engineers.

Dr. Rogers presented results of a contracted program for which the university provided the pedagogical and production assistance for

an industrial training course. The potential exists for significant increases in university involvement with projects of a training nature. This level and type of educational program would be a particularly fertile field for technology faculties, where hands-on training is an important part of their current programs.

This opportunity for technology faculties could improve significantly their self-images and provide new direction for their future expansion--a path increasingly in conflict with existing engineering efforts. Efforts in these programs will also further and strengthen university-industry ties at a time when it is increasingly necessary for the development of a closer partnership.

The WPI Plan, described very eloquently by Dr. Cranch, President of Worchester Polytechnic Institute, was begun ten years ago. While well known in the United States, the program as described received the greatest attention at the morning session.

The WPI experiment appears to be proceeding very successfully. An active step in reforming engineering education, it has combined the theory and the practice of engineering into a dynamic educational program.

One important factor brought out in the discussions was the general lack of effective evaluative procedures. While the need for evaluation was generally accepted, the development of an evaluative procedure was seen as a secondary priority, most often neglected. This philosophy, while understandable, constitutes a serious flaw in our commitment to the development of the continuing education mission.

The economics of the programs were discussed quite often. The use of audiovisual materials for cost-effective programs was mentioned by all speakers, with production costs ranging from a high of $1,000 down to $70 per hour of instruction.

CONTINUING ENGINEERING EDUCATION--NEW ZEALAND VIEWPOINT
Presented by Mr. Robert G. Norman, Assistant Commissioner

In his paper, Mr. Norton described New Zealand's approach to continuing engineering education. In that country the New Zealand Institution of Engineers is the professional body concerned with the practice of engineering and with the profession's changing educational and training needs.

With only 4,000 registered engineers and with annual certification required for engineering practice, it is easier for the institution to develop a professional standard of competence. With so few potential students, however, economic considerations are critical.

The institution has recently developed a formal credit program. It has many similarities with Professional Development in Engineering Certification (PDEC) programs established in the United States, with a plan of continuing educational programs extending over a period of several years. Two major differences exist. The first is governed by economic considerations. In the United States each plan is individually tailored to meet the needs of specific engineers. With such small numbers of students, however, the New Zealand program can offer only a limited number of electives in speciality areas.

A second and perhaps more striking difference is that no evaluation has been established for student performance in the New Zealand program. Credit is given for attendance only.

The institution is working closely with the university extension centers to implement courses. Universities are having difficulty finding resources to staff and maintain the programs. Approximately 50 percent of the university courses involve people brought in from the outside. Industry has been cooperative, providing people mostly on a grace and

favor basis. To quote Mr. Norton, "They don't get paid very much, but they believe it is of real interest to share in the process."

It appears to the writer that the program in New Zealand is much more centrally controlled than could ever be established in the United States. However, because the program is small and highly controlled, it is able to focus on the exact needs of those participating. The development of this program in New Zealand should be watched with interest.

AN UNDERGRADUATE PROGRAM DESIGNED FOR LIFELONG LEARNING
Presented by Dr. E. T. Cranch, President

Dr. Cranch's discussion of the WPI Plan stimulated the most interest and discussion. Dr. Cranch described a bold attempt to create a new form of undergraduate engineering that would initiate in its students a lifetime process of continuous self-education.

A combination of theory and of practice based on projects and voluntary course work, the WPI Plan is a unique contribution to education. It required a strong commitment by the university faculty and administration to overcome the reluctance to change and the inertia so prevalent in our educational system.

In response to concern that the enhanced "project mode or the experimental mode" may result, at the cost of theory, in a reduction of the students' technical competence, Dr. Cranch acknowledged that WPI has not had any major feedback as to the technical proficiency of its students. However, the students do start with the advantage of practical experience that gets them off to a running start in their engineering careers.

WPI achieves very satisfactory results from inexpensively made videotapes. The highly motivated tend to find the tapes extremely

effective. This contrasts significantly with the results of using videotapes in a more formal course of study, where tapes must be very good to achieve reasonable acceptance. The Worchester Polytechnic Institute experience tells us that a great deal can be achieved with very little money if one starts out with a good philosophy.

The program places a high work load on the faculty because of its individualization and nonstandardization. Also, like the New Zealand Continuing Education Program, WPI places a heavy emphasis on societal interaction and on the social responsibility of engineering.

While no substantiating data were presented, the indication was that the program is quite successful. With the accumulation of several years of experience, it would be most instructive to develop an evaluation procedure to judge the results of this unique experiment.

THE CONTINUING EDUCATION IN THE SECRETARIAT OF HUMAN SETTLEMENTS AND PUBLIC WORKS OF MEXICO

Presented by Ing. Francisco A. Beltran Ilizaliturri, Sub Secretaria

The Secretariat of Human Settlement and Public Works is responsible for the continuing education activities of three groups of personnel--workers, administrative personnel, and professionals. The Secretariat of Public Works is responsible for the professional group. The work is done in cooperation with the National Autonomous University of Mexico.

There are several items which stand out in the program of the Secretariat. First, the program is funded by the government through the Secretariat's budget. Second, examinations are given at the beginning and at the end of each course. The results are used to evaluate the progress of each student. Third, student age range, from 26 years through 55 years, allows the mixture of youthful vigor and new ideas with the experience and maturity of the older colleagues. According

to the records of the Secretariat, this beneficial factor expands the learning process of all concerned. Fourth, records of the program have been very carefully kept. In fact, so much data have been accumulated that public dissemination is not practicable except through technical libraries of participating agencies.

A BILINGUAL VIDEOTAPED TECHNICAL TRAINING PROGRAM
Presented by Dr. James L. Rogers, Director

The concept of utilizing university facilities and staff to produce a speciality training course for a company's own use has not been applied often enough. This expanded effort could provide the university with revenue much needed during the current time of tight budgets. Dr. Roger's experience indicates that university expertise in teaching techniques and delivery systems may provide industries with much-needed assistance in their development of training, while enhancing the university's traditional role as an educational institution. While companies often come to the university with requests for courses dealing with theoretical or state-of-the-art subjects, they do not normally consider the university when planning training programs.

The apparent high cost of $1,000 per instruction hour appears reasonable when one considers that the tapes have been in continual use since 1974 and are being used almost as much for reference as for initial training.

An interesting problem dealt with in the project was related to the densities of different spoken languages. The videotapes were to be prepared in English, with translation scheduled for later insertion. Since English is denser than many other languages, compensation must be made to have an effective translation inserted. The solution was

accomplished by allowing audio pauses while the camera focused attention on the visual media.

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Friday afternoon, two concluding Plenary Sessions were held. Gerard Le Roy described the French Continuing Education Law and the effect it has had on continuing education for engineers. Mr. Le Roy's paper was not available at the Conference but is reproduced in Section IV. The final presentation was by Samuel Gould, "Developing a National Need Analysis."

FOURTH PLENARY SESSION

THE FRENCH CONTINUING EDUCATION LAW

SPEAKER: GÉRARD LE ROY

Reaction from the conference participants suggests that France has taken the strongest formal steps of any country in the world in the area of continuing education. Apparently, many countries have laws requiring continuing education for maintenance of licensure and/or professional standing in a number of vocational and professional fields. However, to date, only France has enacted a comprehensive program including both the organization and the financing required for implementation.

The law has been in effect for seven years, and the initial years have been marked by exponential growth in budget and participation. Financing of the program is through a salary tax paid by employers. The tax rate is progressive, increasing with the size of the company, measured in number of employees. In 1977, the latest year for which complete data were available, almost 3 million individuals received over 300 million hours of continuing education.

The legislation is apparently quite adaptable to all sizes of companies and to the needs of employees at all levels of education. Courses need not pertain directly to a current or a desired position nor to the individual's vocation or profession, but may relate to union or personal activities. National and regional advisory committees evaluate needs and determine what will be offered.

The extent of a specific continuing education course or program may vary from a one-day seminar to a one-year leave of absence. The latter requires eight years of prior service. Under the law the program provides for payment of the cost of the course, including expenses as

needed, plus salary, up to a maximum of three times the minimum wage for the individual's current position.

Apparently, the law has not had a major effect on engineers. A substantial variety of courses in engineering are available on a continuing education basis both for the purpose of attainment of new knowledge and for attainment of the initial or higher degrees in engineering. As engineers in their thirties move into supervisory and managerial positions, there is a tendency to shift from a demand for technical to a demand for management courses.

Regarding the presentation, it certainly would have been enhanced by the distribution of a report and possibly also a synopsis of the law. Mr. Le Roy also suffered from a problem common to many of the speakers--a lack of familiarity with the proper preparation and utilization of audiovisual materials. However, his speech was well organized and covered the topic in a clear and orderly manner. Had a more capable translator been available for the English-speaking people, the discussion period would have proven more beneficial.

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FOURTH PLENARY SESSION

ON DEVELOPING A NATIONAL NEED ANALYSIS

SPEAKER: SAMUEL B. GOULD

Dr. Samuel B. Gould's presentation follows closely the written text published in the Proceedings. Some of the points in Dr. Gould's well received paper drew extended discussion. Following are the questions and the responses by Dr. Gould.

Dr. Klus (Wisconsin): Might the employers of engineers be a better provider of continuing education than universities?

Dr. Gould: In many instances, I think the answer is yes. I think one of the major changes that will occur in education—one that is already occurring as we look ahead—is that the line between universities, industries, and other types of organizations is going to become increasingly blurred. I think we are going to begin to realize that the other organizations and institutions have great contributions to make in helping the education process; from a very practical standpoint this might be very well true in the field of engineering. They also have a very important role to play in terms of equipment that has to be used. As head of an institution for a good many years, I used to cringe at the kinds of costs that were forced upon us at the universities by the faculties of engineering and similar disciplines. It was almost inevitable that within a year or two, or five at the latest, most of that equipment was going to be obsolete, and we couldn't afford to replace it quickly. On the other hand, in the various industries you will find up-to-date equipment all the time, and I have never during my entire career been refused by an industry to use for a certain amount

of time, the laboratories or their equipment. I think this is a very essential fact.

Mr. Adams: What advice can you give to institutions that are entering continuing education without a background of nontraditional courses or of delivery systems necessary to market a continuing education program? This could be especially true in the case of the developing countries, whose representatives are attending this conference in large numbers.

Dr. Gould: That is a very important question. First of all, I would say that you should go slowly. The chances are that you will have some advantages and some disadvantages. You will have the advantage of not being bogged down by a lot of traditional notions that others have, and this will make it possible for you to accept new approaches more easily. You will have the disadvantage of not having had experience in these matters. That means that you must go slowly.

Now, I caution you to go slowly for one reason, mainly, and that is the necessity for adherence to high quality in whatever you do. If there is any weak area in nontraditional education or in any of these unconventional patterns, or even in continuing education, which is frequently traditional, it is heard in the accusation voiced over and over again--that there has been a dilution of quality. This we can't afford to have. We can't afford to have it in traditional education, and it is there in many instances. But they get away with it most of the time. Yet you never get away with it in nontraditional education, so I urge you to be absolutely sure of the quality in whatever you do.

The second and last comment I have on this matter is to be certain that you have your own institution convinced that this is an important thing to be done. And that should not just be the concurring of people

in a faculty meeting or general nodding of heads. It should be on paper for everybody to understand. If there is one thing that we fail to do in the universities, it is to specify, in terms that everyone can understand, our rules for existence and how we propose to go about it.

Dr. Chelapati (Long Beach): What is (1) the Mondale Act and (2) the Education Act of 1972? How are these acts helping continuing education?

Dr. Gould: The Education Amendments in the Education Act are from 1972. The Mondale Act was passed in 1977, and you all know who Mr. Mondale is. He was at the time a senator, but now he is the Vice-President. The Mondale Act is a guarantee of lifelong learning as the law of the land. It says that every citizen in the United States is entitled to have as much education as he can benefit from. Now, many said that there are all kinds of problems to work out. For example, in previous presentations you had a very excellent demonstration of what France has done in terms of developing financial means by which some of these people, adults, could actually benefit. We don't have any such federal kind of operation at this moment. We do have individual instances of private industry, unions, and others trying to provide the same kinds of things mentioned previously. But this act puts the responsibility on the federal government, and while no appropriation of any consequence has yet been made to follow up on the Act, I have no doubt that this will come ultimately. The reason I don't have any doubt is that the American people are demanding it and, I'll tell you frankly, the American people always get what they want. Sometimes they get a lot of what they don't want, but they also get what they want if they stand up and ask for it. Millions have been standing up and saying, "We want these kinds of educational opportunities." Women by the thousands are entering into our

colleges and universities and community colleges, and so are people from all walks of life who never dreamed before of the possibility. This is why I'm so certain of the result.

Dr. Kadivar (Stanford): Urban residents in the United States are uneducated about the rural area and its agricultural problems. Do you see this as a problem? If so, what role can continuing education play in this respect?

Dr. Gould: I don't know that I fully understand the question. I don't see any difference between rural and urban problems so far as continuing education is concerned. There are differing ways by which one has to meet continuing education problems in a rural area as opposed to an urban one. But the problems are basically the same, and we have ample illustrations of efforts that are made to do both.

For example, I don't know if you are familar with the University of Mid-America, which is a combination of nine states in the Midwest—the prairie states of Nebraska, Kansas, Missouri, and so on—who have developed what is actually a university entirely for adults, and entirely off-campus. It reaches out all over these states to people in the rural areas and provides for them the kinds of education we've just been talking about. This requires a set of circumstances that you wouldn't have to worry about in an urban institution. For example, we have in that university a professor who goes out into the territory. He goes from place to place and meets periodically with students who happen to be in that particular area and who converge upon him and so on. We also have what is known as a Watts line. I don't know if all of you are familiar with that. It is a phone circuit in which you can use the number and call free, since the circuit that you use is always available. It is available 24 hours

a day at the University of Mid-America. From anywhere at all, a student having a problem with what he is studying may call and ask questions. Those questions will be referred to the professor who is involved with his particular course, and answered for him either immediately or within the next 24 hours.

There are all kinds of techniques that one uses in a rural situation as opposed to an urban. In the urban situation it is no less difficult, it is just different. So unless I am misinterpreting the question, I don't see too much difference in the needs and in which one can meet those needs.

Mr. Jnoriega (Mexico): Have you had specific application within the industry organization of the continuing education system you have described to us?

Dr. Gould: Within an industry organization, oh, yes. We have many examples of that. Not only within industry organization, but in labor organization. I don't know if you are aware of it, but the labor unions are actually leaders in the kinds of continuing education programs they have developed. They actually have a college in Pennsylvania that they have created themselves; they provide a campus experience, weekend college and that sort of thing for a student.

In industry as well there are examples of individual industries. The Bell Telephone System—I wish I could think of lots of examples, but we haven't the time for them—years ago decided its junior executives needed to be better people than they were. Not necessarily better engineers or better managers, but better people. They did not think they had a breadth in what they perceived. So they developed a program in the humanities. This program was given at Dartmouth and also at the University

of Pennsylvania. They had the junior executives attend this program for three to six months, and the change in some of them was remarkable. I have had personal experience with this at an institute in Colorado, where I moderated seminars with business executives and sometimes with engineers. Incidently, dealing entirely with the liberal arts and the humanities is a great experience to have in a seminar. Think of seeing the president of a major corporation talking about Plato and wondering why Gulliver's Travels was written. These people go out of there as different people; I have watched them as a result of what they have done, and it has been one of the most gratifying experiences I have ever had. Yes, there are many such instances. There are also instances of failure too, I may add.

Dr. Jordanides (Long Beach): I would like to predict that continuing education according to Mondale may become like welfare in the United States: big and expensive. Any comments?

Dr. Gould: Naturally, I hope not. I agree to this extent: I think that if we are going to depend upon the federal government in the United States to provide all the resources on which continuing education is to develop and flourish, then the fear that is expressed in that question is a very appropriate fear. I would hope, however, that this is not the way it will work out. I would hope it will follow more closely the process similar to which private enterprise in the United States, coupled with federal assistance, brought about.

We are having a perfect example of that right now in the encouragement of the arts in the United States. I don't know whether you follow that closely or not, but I hope you do. Engineers should follow the arts a great deal. In the United States today, there is an enormous

push on the part of business and industry towards assistance to develop the performing arts. There is also a very strong effort of real government. There is an endowment for the humanities, but there is a balancing factor in the amount of investment being made by private over public TV. You may have noticed how many of the corporations and other organizations of that type have involved themselves in supporting what they feel to be programs that are worthwhile culturally. I hope it's going to be that kind of balance. I would agree that if we are going to turn this entirely to the federal government, it would be a very dangerous thing.

Dr. Jordanides (Long Beach): In this age of state government cutting down funding of regular university programs, how do you expect to fund such continuing education missions within a university?

Dr. Gould: I think it is the greatest opportunity a university has ever had. I think a very large percent of the people who want adult education are willing to pay for it, or at least part of it, and sometimes all of it. If they aren't, their employers are. I don't think that carefully organized and carefully run programs necessarily mean a greater drain on the university. I think it may actually give stability to the university, and over the long run you are talking about encouraging support for all universities and all their activities. It creates an atmosphere of support you could never get in any other way. The thousands and thousands of people, all over the states, who are involved with an institution by taking its courses or by having relatives take its courses, aren't going to let the university die. They aren't going to let it fall back. I know this from personal experience in New York, where we had 72 campuses and were spread all over the state. And I tell you, when the legislature began to realize

how many communities and how many people in their constituencies we were helping to get more education, they thought twice before they cut back. I think this area of continuing education may well have more promise for encouraging and strengthening higher education than anything we've ever had in the past.

Summary

In his answer to Dr. Klus, Dr. Gould mentioned that universities request a lot of money for new equipment. Even though they request a lot of money, most of the time the money is not allocated; most universities except for the very big research institutions work with obsolete equipment. Industries cannot share their equipment with universities because they have to use it for profit-making enterprises. However, there are instances of cooperation between universities and industries on the use of some specialized equipment for research.

I agree with Dr. Gould that there is a great need for continuing education in the everchanging world of technology. There are needs for quality programs that are offered in modes different from those normally given by universities. These programs inherently need more resources than those normally funded by the universities if they are to successfully serve the everchanging needs. The funding should come through fees from the constituencies who profit directly from these programs. Federal government could support part of the cost of programs on a selective and competitive basis, so that the fees for the courses would not become unduly prohibitive.

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IV PAPERS

The three papers in this section were received too late to be included in the Proceedings. However, since they are of widespread interest, they have been reproduced. Mr. Le Roy's paper was received in French and was translated by Jim Barron at the University of Wisconsin—Madison.

French Legislation

on Continuing Training

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FRENCH LEGISLATION ON CONTINUING TRAINING

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"Lifelong education constitutes a national obligation. Its goal is to ensure man's education and development throughout the course of his life and to enable him to acquire the knowledge and full range of intellectual and manual capacities which lead to his fruition and to cultural, economic, and social progress in general." So it is that the French legislator expresses himself in Article I of the Act of July 16, 1971, the orientation of technological education.

The continuing training that follows initial training has thus become a national obligation. It is therefore not surprising that it has undergone a considerable development in the course of recent years.

The above Act follows the agreements reached on July 9, 1970, between organizations of salaried employees and those of business leaders.

As partners in society, they effectively recognized that all workers stand to benefit from the opportunity to continue their training, since it is no longer possible at school to acquire, once and for all, the sum total of knowledge needed in later life, and since the evolution of the sciences, technology, and the economy will lead workers to change jobs during the course of their careers.

The Act of July, 1971 consequently gave a particular push to continuing training, but has nonetheless not completely resolved all the problems involved. New additional agreements, such as those of July 9, 1976, have been concluded and the initial legislation has been complemented by new legislation such as the Act of July 17, 1978, relative to "the individual's entitlement to educational leave-time and the remuneration of those enrolled in occupational training courses."

In an attempt to present French legislation on continuing training, we shall describe those provisions which assure its financing and those which establish a framework for its development. Keeping in mind the theme of this Congress, we shall conclude with a brief sketch of continuing training as it affects engineers and also with a brief summary of the activities of engineering schools in this area.

I. PROVISIONS TO ASSURE THE FINANCING OF CONTINUING TRAINING

Financial provisions for continuing training are decidely liberal in scope, since they seek to organize a training market. As a general rule, the applicant (who may be an individual, a business firm, a local community or administration) negotiates with a training organizer in order to define a program, the number of hours, the place . . . and the price. Several factors must then be considered, for the financing is underwritten both by business and by the State.

1.1. BUSINESS FIRMS

1.1.1. Cost of participation

Employers employing a minimum of ten salaried employees are expected to contribute to the development of continuing occupational training with the exception of the State, local communities and those of their public bodies which are of an administrative nature.

Each firm's degree of participation must equal at least 1.1 percent of its current gross salaried payroll. The law had originally projected a starting rate of 0.8 percent in 1972 to reach 2 percent in 1976, but economic difficulties and the level of need led to the present moderate rate.

This very important budget (Fig. 1) reached 7.5 billion francs in 1977. (Exchange rate 1977, approximately 21.254 cents per franc.)

Fig. 1

	1972	1973	1974	1975	1976	1977
Compulsory contributions (Percent)	0.8	0.8	1	1	1	1
Actual contributions (Percent)	1.35	1.49	1.63	1.62	1.62	1.74
Budget (billions of francs)	2.8	3.7	5.0	5.8	6.5	7.5

Regulatory statutes specify the nature of the expenditures considered, the types of training covered, and the controls to be exercised.

1.1.2. Collaboration between the head of firm and his salaried employees

Business firms can deduct from the cost of participation in continuing training any training program established

by the firm, or they can deduct the fee of training establishments that have concluded an agreement with the firm. In principle, the employer is free to choose the types of training programs that he intends to finance. However, several corrective provisions have been written into the law so that any decision concerning training must be made in close collaboration with salaried personnel. Thus, employers who have more than 50 salaried employees must see to it that their management board deliberates all business projects relative to the training and improvement of their personnel. Furthermore, the management board must be kept aware of the status of these projects. The management board's failure to consult on these matters can result in the levying of a considerable fine, equal to 0.5 percent of the firm's gross salaried payroll.

The role of the management board is consultative. Nonetheless, an agreement signed in 1976 carefully spells out the legal restrictions governing the consultative sessions to be held by the management board. Thus, there must be at least two board meetings. The first--to be held prior to November 15--is to be devoted to examining the balance sheet of those programs already initiated and to examining as well the general orientation of the firm toward developing a training plan for the firm's personnel. The second board meeting is to be set aside for an examination of programs for the following year and for the written deposition of their deliberations. The agreement also specifies the points to be covered by the board in its deliberations:

- the different types of training and a breakdown of the individuals concerned according to occupational groupings;
- the teaching methods used, distinguishing between those training programs organized within the firm and those organized by outside training centers;
- the steps for implementing on-the-job training programs;
- budgetary appropriations corresponding to the projects to be undertaken by the firm;
- means by which salaried personnel are to have access to information, particularly information relative to the training courses agreed upon by the joint labor/management employment commissions.

In the French context, this arrangement, which tends to bring the firm's training policy under the watchful eye of the trade unions, is very important. It is intended to lead at length to an agreement between the trade unions and the firm over the training plan to be implemented. This measure has thus served to bolster that portion of the training budget set aside for workers, employees and agents de maîtrise (technicians involved in low-level management) and has consequently served to put the brake on the progressive training expenditures earmarked for management staff.

1.1.3. Different types of expenditures allowed by law

The employer can fulfill his training obligation in several well-defined ways:

a) by directly financing training programs for the benefit of his employees.

b) by contributing to the financing of fonds d'assurance formation (guaranteed training funds).

c) by arranging for payments of up to 10 percent of his compulsory contribution to approved institutions.

d) by financing training programs organized by approved training centers for the benefit of job applicants covered under a work contract.

e) by making payments in the form of a surtax to be used for occupational training in certain professions (Building and Public Works, Automobile, Cycle and Motorcycle Repair, Transportation, and Architecture).

f) by making payments to a Chamber of Commerce and Industry for use in occupational training.

g) in those cases where these expenditures do not meet the employer's obligation, the difference must be paid to the Public Treasury.

Further details concerning the first three options are given below:

a) Training programs for the benefit of the firm's employees

The business firm can conduct the training itself (either on the premises or elsewhere) with its own teachers, materials, and pre-established programs.

Admissible expenditures are: teachers' and students' salaries, including employee benefits, supples and work materials, the purchase of specialized equipment necessary for the training, and the depreciation of those premises set aside for the training.

In other cases, the training is considered external because it is conducted by an outside institution with which an agreement has been concluded. The training can take place either on the premises of the firm or elsewhere.

The agreement can be either bilateral or multilateral. In the latter case, the agreement is concluded between a training center and several business firms.

The agreement can cover training programs that are to be completed in one civic year (annual programs) or in several civic years (multiannual programs).

Every agreement must contain a certain number of compulsory clauses:

- nature, purpose, and length of the program
- individuals involved
- unit price of the training
- total assets of the training school
- amount of annual payments to be made by the business firm when the agreement is multiannual

Other optional particulars are sometimes furnished:

- teaching methods and techniques used
- manner of handling the costs of teacher training for the instructors and their remuneration
- in the case of salaried employees, the special privileges accorded the latter, should the need arise, in order for them to participate in the programs in which they intend to enroll, especially time off from work and the rescheduling or reduction of their hours
- the breakdown of fiscal expenses relative to the operation of the program and the remuneration of those students enrolled, as well as, should the need arise, the construction and equipping of the training centers involved

- means of amicably resolving those difficulties which may arise when the agreement is carried out

b) Financing of the Fonds d'Assurance Formation

A Fonds d'Assurance Formation works in the form of a guarantee and allows a firm to free itself from participation through financial contributions which will ultimately cover the training expenses incurred by the firm either directly or through a salaried employee, acting on his own initiative, within the framework of a congé-formation (training leave).

These Fonds d'Assurance Formation may be found within the context of a single firm, a particular business sector, or several firms engaged in different operations.

They permit a consolidation of training efforts and provide salaried employees with an added assurance, insofar as training is concerned, because they equally involve both employers and salaried employees.

There is no specific limit on the sum of money a firm may pay into a Fonds d'Assurance Formation.

Nonetheless, the total resources committed must not exceed by more than 10 percent the total capital necessary for the financing of those interventions planned for the current year.

c) Institutions approved to receive 10 percent of contributions

Certain institutions can be approved at the national level by the Prime Minister or at the regional level by the Regional Prefect.

Any business firm can allocate up to 10 percent of its contribution to one or more of these institutions which have been approved because of their general interest in continuing training.

1.1.4. Some results

Noticeable differences occur (Fig.2) according to the size of the firm (in 1975).

Fig. 2

Number of salaried employees in the firm	Cost of financial participation by the firm (%)	Total number of trainees	% of trainees, engineers, or management staff
10 to 19	0.69	22,000	26
20 to 49	0.89	86,000	22
50 to 499	1.17	452,000	18
500 to 1999	1.49	328,000	17
2,000 to more	2.55	848,000	12

In 1975, the nature of business expenditures may be summarized as follows (Fig. 3):

Fig. 3

	Millions of francs
- Operation of in-firm training programs	1,222
- Equipment	80
- Operation of outside training programs	1,252
- Remuneration of trainees	2,438
- Payments to Fonds d'action Formation	318
- Trainees' transportation and lodging	159
- Payments to approved institutions (10%) and surtaxes	166
- Payments to the Treasury	190
	5,725

The portion of these expenditures which goes toward continuing occupational training for engineers is not known. However, the breakdown of trainees according to occupational groupings is known.

Fig. 4 reveals that since 1972 the number of engineers and management staff participating in training programs has consistently decreased. In 1977 these two groups represented only 15 percent of the trainees and 14 percent of total training hours.

Fig. 4

	Trainees (%)						Hours of Training (%)
	1972	1973	1974	1975	1976	1977	1977
Unskilled and semiskilled workers	18	17	17	16	17	16	18
Skilled workers	36	41	44	46	46	46	44
Agents de maîtrise, technical specialists, and techniques	27	25	24	23	23	23	24
Engineers and management staff	19	17	15	15	14	15	14
	100	100	100	100	100	100	100
TOTAL (in millions of persons)	1,[illegible]30	1,490	1,790	1,790	1,814	1,774	101,400 millions of hours

1.2. THE STATE

In 1977, 894,000 trainees enrolled in training programs financed by the State. This amounts to about 206,000,000 hours of training.

The blanket allocation earmarked by the State for this continuing occupational training was 3.5 billion francs, or:

- 1.35 billion francs for the remuneration of trainees
- 0.25 billion francs for the equipping of training centers
- 1.9 billion francs for the operating of the training programs

1.2.1. Procedure for the handling of appropriations

a) - An increased collaboration

According to normal procedure in France, State appropriations are made according to the purpose to which the user intends to put them: the use of building space, maintenance appropriations, supply purchases, educational appropriations, employees salaries, etc. . . . The procedure instituted by the Act of 1971 has not changed this situation, but it has worked to coordinate the national and regional levels of government.

- At the national level, all appropriations have been grouped together in a single packet watched over by the office of the State Secretary for occupational training. The latter is assisted by the Interministerial Committee, which brings together all the ministers involved, by a permanent group of high-ranking officials, and by the National Council on occupational training, social advancement, and employment, which includes the representatives of the public Powers, professional societies, and those trade unions involved.

b) - Recourse to agreements

The new programs in effect since 1971 have generally been financed through the conclusion of agreements between the State, training schools, and, in the long run, other parties as well. This technique of agreements has also been employed in the case of those institutions directly dependent on the State, such as the universities and engineering schools, lycées, and collèges. This procedure--which tends toward the creation of a business market and which causes competition among the institutions of learning--has not come about, however, without creating certain difficulties for these institutions accustomed as they have been to a certain amount of security and to freely allocated government appropriations.

1.2.2. The Nature of the programs and those areas of the general public involved

The machinery created by the Act of 1971 sets aside State appropriations for those programs which cannot be financed by a business firm, either because of their nature or because nonsalaried employees are involved. If the Act of 1971 prefers to retain the term stages, the Act of 1978 prefers to use the term actions, which more widely enlarges the field of training.

The new Act also modifies the order of priority vis-à-vis the 1971 programs. The Act of 1978 views the occupational life of salaried employees as its guiding principle (access to jobs, promotion, lay-offs). Other matters are also viewed in light of that principle.

Of special note are:

a) Programs involving pretraining and preparation for occupational life

Their purpose is to enable every individual, without occupational qualification and without a work contract, to attain the level necessary for enrollment in an occupational training program, properly so-called, or for entrance into occupational life.

b) Adaptation programs which make for easier access to a first job or to a new job for those workers covered by a work contract.

c) Promotion programs which allow one to acquire a higher qualification.

d) Prevention programs which are intended to reduce the risks of not adapting qualifications to the evolution of technology and the structure of business firms by preparing the worker whose job is threatened for a change in activities, either within or outside the framework of the firm where he is presently employed.

e) Conversion programs
These should enable salaried workers, whose work contract has been severed, to go on to new jobs requiring different qualifications or enable nonsalaried employees to go on to new areas of employment.

f) Programs for the acquisition, maintenance, or improvement of skills which go beyond the purely occupational boundary, for their purpose is to open workers up to the Arts and to lead them to assume the responsibilities that accompany life in society.

Pursuant to the dictates of necessity, special efforts are made to satisfy certain public priorities, such as:

- social advancement

- young people in search of a first job

- workers who have been laid off or are unemployed

- women seeking employment

- training of immigrant workers

- the handicapped

The continuing training of engineers has received few new appropriations from the State.

The third part of this article will explain the pathways leading to degrees.

It should be noted that in 1975, 57,000 engineers and management staff enrolled in programs financed by the State, i.e., about 6.4 percent of the total number of trainees helped by the State.

II. THE ORGANIZATION OF THE DEVELOPMENT OF CONTINUING TRAINING

2.1. THE RIGHT TO TRAINING

Interoccupational agreements and the Acts of 1971 and 1978 not only recognize the individual's right to continuing training but encourage individual achievement and clearly state the right of all workers to a form of training that is freely chosen.

2.2. THE RIGHT TO A TRAINING LEAVE OF ABSENCE

According to the work code, "the purpose of a training leave of absence is to enable each worker, in the course of his occupational life, to enroll, on his own initiative and according to his own needs, in training programs irrespective of his enrollment in courses included in the training program of the firm where he is employed."

"These training programs should enable workers to attain a higher level of qualification, to change activities or occupation and to become more involved in the Arts and in social life."

Any worker may therefore request to benefit from a training leave of absence provided that:

- he has been employed from more than two years in a particular occupational branch, six months of which must be with his present firm (except for those who have changed jobs following an economically motivated layoff)

- the number of employees on leave does not exceed 2 percent of the firm's total manpower

- he has not recently benefitted from a training leave of absence.

Duration and financing of these programs

The leave time corresponds to the length of the training program and can, in certain cases, exceed one year or 1,200 hours.

The employer cannot refuse a request for remunerated leave time if the percentage of salaried employees profitting from a leave of absence does not exceed 0.5 percent (0.75 percent for management staff).

Under a program approved by the State, the salaried employee will be remunerated according to the length of time involved and the said remuneration will be paid to him either by the State alone, or by the State and the employer, or by the employer alone.

In the case of those programs lasting less than 500 hours, the earlier remuneration will continue to be paid by the employer during the first four weeks (or 160 hours). The State will then take over the payments.

In the case of those programs lasting from 500 to 1,200 hours (or one year), the employer maintains the earlier remuneration for the first 18 weeks (or 500 hours). The State then takes over the payments.

The method of calculating the amount of remuneration paid by the State is very complex, but this remuneration reaches an eventual ceiling fixed at three times the Minimum Inter-occupational Increase in Salary.

2.3. OTHER SPECIFIC TYPES OF LEAVE TIME

2.3.1. Leave time for the purpose of preparing and taking certain examinations leading to a degree or an officially recognized diploma

2.3.2. Educational leave time for young workers open to young salaried employees less than 20 years of age and without professional certification.

The said leave time can add up to 200 hours a year during the first two years of employment.

2.3.3. Teaching leave of absence

Limited solely to engineers and management staff in 1971, it has included all salaried employees since 1978.

This leave of absence gives salaried employees the opportunity of withdrawing from their firm for a period of one year for the purpose of teaching others.

Based on his professional area of specialization, the salaried employee must then select the area of technology he wishes to teach.

The salaried employee on a teaching leave of absence is still bound by work contract to his employer as in the case of training leaves of absence.

III. CONTINUING TRAINING FOR ENGINEERS AND THE ACTIVITIES OF ENGINEERING SCHOOLS

3.1 ENGINEERS AND CONTINUING TRAINING

It is difficult to determine the influence of legislation on continuing training in the case of engineers, since the latter have not awaited the enactment of legislation in order to continue their training.

It is however probable that additional opportunities have been accorded them.

According to the statistics available, it appears that the number of engineers participating in programs of continuing training has remained stable: 56 percent for the past ten years if one relies on the surveys conducted by the Fédération des Associations et Sociétés Francaises d'Ingénieurs Diplômés (FASFID).

It is interesting to note (Fig. 5) that the areas of study of interest to engineers are primarily business administration, organization, and management, followed by foreign languages.

The average length of time annually devoted to this training is on the order of six to ten days.

This same survey conducted by FASFID, and dating from 1977, provides an indication of the motives behind the desire for self-improvement (Fig. 6).

Fig. 5

BREAKDOWN OF NUMBER OF ENGINEERS BY AGE GROUP AND COURSE OF STUDY

Course of study / Age group	1	2	3	4	5	6	7	8	9	TOTAL
Beginners	102	65	70	45	73	83	45	24	32	589
Less than 29 years of age	819	547	603	368	664	679	528	171	258	4,637
30 to 34	745	504	678	491	937	838	689	232	240	5,354
35 to 39	508	317	397	406	876	612	494	199	138	3,947
40 to 44	308	214	251	380	705	470	431	146	122	3,027
45 to 49	222	222	202	356	706	408	375	125	128	2,744
50 to 54	132	120	154	263	506	226	292	106	78	1,877
55 to 59	43	57	76	100	197	110	95	35	42	755
60 to 64	19	19	27	22	43	18	20	5	10	183
65 or older	6	10	3	5	13	5	4	2	0	48
TOTAL	2,802	2,010	2,391	2,391	4,647	3,366	2,928	1,021	1,016	22,572

The courses of study are:

1. The Sciences
2. Technology
3. Information Theory
4. Economics--Finance
5. Business Administration--Organization--Management
6. Languages
7. Psycho-Sociology--Human Relations
8. Marketing
9. Other

Fig. 6

BREAKDOWN OF ENGINEERS ACCORDING TO MOTIVATION AND COURSE OF STUDY

Course of study / Motivation	1	2	3	4	5	6	7	8	9
Improvement of job skills	2,062	1,531	1,631	1,272	2,764	1,997	1,737	597	659
Career advancement	140	130	179	329	716	322	316	173	69
Change of careers	124	77	152	174	317	160	159	92	66
General information and interest	449	257	407	599	813	843	680	150	206
TOTAL	2,775	1,995	2,369	2,374	4,610	3,222	2,892	1,012	1,000

The areas of study indicated by numbers 1 through 9 are the same as those in Figure 5, i.e.:

1. The Sciences
2. Technology
3. Information Theory
4. Economics--Finance
5. Business Administration--Organization--Management
6. Languages
7. Psycho-Sociology--Human Relations
8. Marketing
9. Other

3.2 ENGINEERING SCHOOLS AND CONTINUING TRAINING

Although Engineering Schools have, since their very creation, organized conferences for people on the outside, it is only since 1956 that well-structured training sessions have been organized by the I.T.R. (Roubaix), then by the I.S.E.N. (Lille).

Today, most of the 150 Engineering Schools offer both inter- and intra-firm training programs, of short duration (20 hours to 5 days), intended for engineers but also for management staff, technicians, agents de maîtrise, even for employees and workers. The subjects treated cover their areas of specialization but also the basic sciences, foreign languages, and the social sciences.

A recent publication by an organization of professional metallurgists (U.I.M.M.) breaks down the socio-occupational groupings according to areas of study:

Fig. 7

	Technological Courses %	Courses in Economics, Business Administration, Human Relations, etc. %	Languages %	Average %
Heads of firms high level management staff	10	22.6	8.2	11.3
Engineers and management staff	60.7	46.1	62.9	59.2
Others (advanced technicians, agents de maîtrise, workers)	29.3	31.3	28.9	29.5
TOTAL (%)	100	100	100	100

A half-dozen schools have a turnover in excess of 2.5 million francs, and a dozen schools range between 0.5 and 2.5 million francs.

As for the entire area of higher education, the statistics are well known:

Fig. 8

	1973	1974	1975	1976	1977	1978 (forecast)
Turnover (millions of francs)	42	69.2	106.1	122.5	144.9	171.8
Number of participants	54,427	89,579	129,952	118,404	128,532	135,587
Number of hours x participants	5,404	7,513	11,200	13,223	14,257	15,512

It is evident that the Engineering Schools do not have a monopoly on continuing training of engineers and that they have opened themselves up to other groups.

3.3. ATTAINMENT OF AN ENGINEERING DEGREE THROUGH CONTINUING TRAINING

The title of certified engineer is protected in France by legislation which covers, in particular, the honors conferred by the Commission des Titres d'Ingénieur, whose members are appointed by the Ministère des Universités.

Each year, about 10,000 Engineering degrees are presented in France. The vast majority mark the final stage in the work of students completing their initial training.

However, several degrees are awarded through continuing training. These latter may be obtained in several ways:

a) The Conservatoire National des Arts et Métiers (C.N.A.M)--founded in 1794, located in Paris but with branch centers throughout France--organizes both day and evening classes in the form of modules that include courses in theory, applied theory, and independent study. When the student has successfully passed an examination, he receives one credit. Based on the credits received, several different degrees are conferred:

- Diplôme de Premier Cycle Technique (D.P.C.T.)
- Diplôme d'Etudes Supérieures Techniques (D.E.S.)
- Diplôme d'Ingénieur du C.N.A.M.

b) In an extension of the work done by C.N.A.M., certain institutions are entitled to admit by examination those persons holding a D.E.S.T., who will then commit themselves to an additional 24 to 36 months of study (for which they receive a remuneration on the order of 2,500 francs) in order to become engineers.

c) A certain number of large industrial firms are behind the creation of the Centre d'Etudes Supérieures Industrielles (C.E.S.I.) which has been supported by the State and whose diplôme d'Ingénieur is now recognized by the Commission des Titres d'Ingénieur.

This particular institution is for full-time students and turns out, in two years' time, fabrication engineers, maintenance engineers, systems engineers, control engineers, and on-site engineers.

In order to be admitted, the candidate must hold a baccalauréat and have had at least five years industrial experience as an agent de maîtrise, draughtsman, or technician.

d) Since 1973, the Ecole des Techniques Industrielles et des Mines de Douai has a complementary section for the benefit of those persons holding a D.P.C.T. and D.E.S.T. from the C.N.A.M., a Diplôme de Technicien Supérieur, D.U.T. or B.T.S. (Licence ès Sciences) and who have a mimimum of three years industrial experience as a technician or agent de maîtrise with full responsibilities.

Once admitted, the candidates undergo 20 months of training with 4 months of actual on-the-job training and are eligible for a remuneration of approximately 2,500 francs a month.

The present graduating class consists of 20 students.

e) By the decree of January 31, 1974, a diplôme d'Ingénieur can be conferred through the Continuing Training Program, a degree that is identical to that conferred by the school on those students that have completed their initial training.

The candidates must enroll in a cycle préparatoire and in a cycle terminal, organized on a full-time basis or, if necessary, on a part-time basis.

The cycle préparatoire, which lasts from 6 to 18 months, is intended to verify the candidate's aptitude and to furnish him with the necessary knowledge he may be lacking.

The classes taught under this program are generally conducted at night or by correspondence, although the participants are always brought together from time to time.

The cycle terminal, which lasts from 12 to 18 months, is open to those candidates who hold a diplôme de Technicien Supérieur, who have at least three years work experience as an advanced technician and who have already completed the cycle préparatoire.

In 1979, the number of candidates apt to earn this certificate is very small, on the order of 50 individuals.

In conclusion, it is clear that French legislation on Continuing Training has proven itself capable of adapting to the needs of a developed industrial society. The surveys conducted show that this legislation has been generally well received.

The members of society continue together to improve upon this legislation when they feel the need to do so.

The existence of Continuing Training helps avoid an increase in the number of years students must remain in school, including those in the field of engineering. The program's existence also forces a reconsideration of those programs traditionally offered by educational institutions. This interaction is only normal, since continuing training and initial training are viewed as two parts of the whole realm entitled Lifelong Education.

Thus, as far as education is concerned, nothing is ever completely gained, but nothing is ever completely lost—and so it is for all men.

CEE IN THE USSR:

ON EXPERIENCE AND SOME CONCEPTS

By: V. Y. BESPALOV,
Associate Professor, PhD
Dr. L. D. FILIPPOVA

I would like to talk not solely on the projects in EE field, as the programme of our section indicates, but also to give you appropriate information on our approach to the CEE as a whole, to get you acquainted with different types of CEE studies existing in the USSR, to share with you our problem in this very important field of education.

These programs concern all fields of engineering and power engineering as well.

In the Soviet Union great attention is paid to continuing education. One of the most important ways for continuing education is the system of evening and correspondence courses, run practically by each institution of higher studies and short-course institutions. Incidently, in many countries of the world this kind of education is considered to be an innovation. In the Soviet Union we have practiced this system of education for about 60 years. Thus, it is a well-developed system. What is significant about this system is that it carries the same status as a regular system of higher education. It means that students graduated from evening or correspondence courses will have diplomas equivalent to those given to resident graduates. Right now we have, altogether, four million students in this system.

As for the diploma holders, particularly in engineering fields, we have annually 1.2 million engineers and technicians in different levels of continuing education programmes.

Our state organizes and completely runs this large scale educational system, which is fully subsidized by the state government. The CEE subsystem forms an inherent part of this state educational system.

Under the conditions of planned economy, we have a goal of making the CEE system a well-coordinated and developed branch of education.

This planned system of CEE allows us to establish a common rule, according to which all engineers and managers are to take continuing education courses every six years, usually on a full-time basis. When we make CEE planning, we can assess manpower needs much better. We do this with an immediate connection with trends and perspective of economical development of the country, its republics, and regions.

CEE in the USSR is increasingly meeting the requirements of rapid advances in science and technology, including social and culture demands. This has been undoubtedly facilitated by special decrees edited by our government during the last two decades. The main idea of the last decree of 1977 is to transform CEE capabilities which now exist in different branches of economy to the United States system.

At present, a broad network of CEE centers is functioning all over the USSR. This network contains:

1. Ninety CEE institutes in all branches of the industry. The institutes provide practicing engineers, managers, and research personnel with full-time and part-time courses from one to six months duration. If the period of a course exceeds a month, sometimes two forms of study are combined--a regular one and a correspondence course. It means that participants have classes in the institute only during two weeks at the beginning of their course and two weeks at the end. The rest of the time is given for individual study.

   In 1971 a special institute of higher management was established. This institute deals with CEE of high-level managers: the ministers, their duputies, and the directors of industrial exterprises and firms.

2. In addition, we have 93 CEE departments as part of engineering institutions. These departments cater for working engineers in the middle-management level. Full-time study at these departments ranges from one month to one year.

More than 700 CEE short programs are functioning permanently inside the industrial enterprises, research and design institutes. These programs meet the requirements of specialists in specific fields of technology (e.g., welding, casting, etc.).

Altogether, annually about 20 to 25 percent of the engineers and managers of our industry go through the CEE network described.

3. In addition, we have eight CEE institutes and about 121 departments for the teaching staff of engineering educational institutes. Compulsory full-time courses must be taken each five years.

Engineering educational institutes play a considerable role in the CEE, since their teaching staff possesses the highest qualification both in the engineering and methodology of teaching. This provides the engineering staff with good experience for cooperation with industry.

At present, 190,000 professors and Ph.D.'s are working in 861 institutes and universities in the USSR. A good percentage is engaged in continuing education.

Last year a special division was established in the structure of Ministry of higher education. The decisions made by this division must be carried out in all other Ministries having continuing education institutes, departments, and courses.

This newly established division performs the following functions:

- Making suggestions on how to improve the efficiency of CEE courses and find their optimal format

- Development of regulations governing the CEE institutes and departments
- Development of methodical principles for CEE courses
- Assessment on the effect of CEE courses on job performance of participants
- Evaluating the quality of CEE programs in different branches of industry
- Dissemination of information on CEE, textbooks, and other learning material available from home institutions and from abroad
- Analysis of proposals by industrial Ministries for the establishment of new CEE institutes and departments

Right now we have 36,056,000 trainees in new professional activities, including 1,200,000 in CEE courses. When you have such a large-scale CEE system, these arise problems of optimal correlations between various needs, as well as the problems of durations and frequencies of required courses. In addition, we have to assess the effectiveness of CEE courses and to find suitable criteria for this assessment.

At this time, we determine a course need mainly by experience. This problem may be solved via a so-called "engineer of the future model," which is now under development in our country.

POSTGRADUATE STUDIES FOR ENGINEERS IN THE MEMBER-COUNTRIES OF THE COUNCIL FOR MUTUAL ECONOMIC ASSISTANCE

By: Prof. JanuszTymowski
The Chief Technical Organization in Poland

In the late sixties all the socialist countries, in order to accelerate their technical progress, carried out important research works aimed at increasing and widening qualifications of their technical staff. According to the dominating trend, the primary responsibility for organizing postgraduate training was put on universities and other schools of academic rank. The organizational schemes accepted at that time have remained practically unchanged.

BULGARIA. Organizing postgraduate studies in engineering colleges was started in 1966. In 1967, four courses with 93 participants were organized. In 1969-1970, such courses were run by seven universities, and the number of courses and participants amounted to 149 and 3,327, respectively. In 1975, the number of engineers taking part in different kinds of postgraduate training was expected to reach 5,350.

Professional improvement for university graduates is a part of the general scheme of vocational training in Bulgaria. It is subordinated to and supervised by the State Committee of Science, Technical Progress, and Schools of Academic Rank, with the exception of postgraduate studies for executive and medical staff. The following organizational cells are involved in the scheme:

1. The Interdepartment Committee for Postgraduate Studies, which is a consultative body. It consists of representatives of the ministers who are held responsible for vocational training of the staff. The

committee takes the problem into consideration and prepares proposals dealing with:

- The cooperation of departments in the field of postgraduate studies for university graduates
- The creation of a proper material base at universities
- Arousing the workers' interest
- The general methodical problems of the state's policy in the field of professional improvement and increasing qualifications

2. The section of postgraduate specialization and professional improvement which is an executive body of the Committee. Following the proposals of the ministries, it prepares programmes, yearly and long-range plans of postgraduate training, and also creates the proper conditions for their implementation by universities and scientific-technical associations, such as:
   - Undertaking steps aimed at employing lecturers and ensuring necessary publications
   - Organizing international cooperation and controlling the course of the training

   The section is financed from the budget of the Committee. It is being planned, however, to call into being the Head Office of Postgraduate Training for the workers with academic diplomas. It would work with its own self-financing balance.
3. The sections of professional improvement at universities and schools of academic rank which are directly involved in research works in that field. In 1969-1970, such sections were organized in all institutes of technology. Each section has its Didactic and Methodical Council, which consists of professors from the university in question

and representatives of the departments whose workers are additionally trained at the university.

The sections of professional improvement are financed from the charges paid by the departments according to the agreements concluded with the university and the cost calculation of each course.

Alongside the universities and institutes, additional training and postgraduate studies are also organized by scientific-technical associations--NTO. They cooperate with the Committee and have the right to organize 30-day courses during working hours and even 60-day courses outside working hours. The scientific-technical assocations--NTO--cooperate with the Committee of Science, Technical Progress, and Schools of Academic Rank, universities, and the Central Council of the Trade Unions in order to increase the standard of additional training. The NTO Committee for increasing qualifications of workers at the Headquarters of the NTO has been working out new forms of planning and controlling the results of such newly introduced forms as "self-education" and "training in the place of employment."

In order to improve the activity of the Institute for Professional Additional Training, a meeting has been organized with the participation of managers from the Institutes's sections, which have been called into being at city councils of the NTO. During the meeting, research works of the Institute have been analyzed and new applications of audiovisual aids have been presented.

The Institute for Additional Training organized, in 1975, 506 courses with 12,516 participants; 7,440 short courses dealing with the most current and up-to-date problems, which were attended by 170,153 students; and 367 courses of foreign languages for 5,617 people.

Postgraduate studies at universities are run for workers with a university diploma. Students attending the courses outside working hours are given the right of extramural students to have a five-day holiday for each month of their studies. Lecturers are recruited from the most outstanding scientists and workers of universities and research institutes, as well as distinguished industrial specialists. Sometimes, if necessary, foreign lecturers are also invited. A special pay scheme has also been prepared.

According to the specialization and the technical progress in the given branch of science and technology, graduates of institutes of technology should undergo different forms of postgraduate studies every five to eight years during the whole period of their professional career. As a rule, their additional training should be continued in the same university they have graduated from.

The specialists who have completed such courses of additional training are entitled to be promoted to a higher position than has been provided for in the pay scheme for employees with their experience. In other cases, they are first to be promoted, or even, in some branches, they are entitled to a special monthly allowance amounting to 15 levs.

The following forms of increasing workers' qualifications are in use:

1. Long-term additional training:

   1.1 Professional improvement in the strictly defined branch connected with the worker's specialization. Its task is to introduce new methods, technologies, and machines. Its duration varies from two to four months.

1.2. Specialization aimed at:

1.2.1. specialization restricted to a small branch within the given specialization. Its advantage is that universities can organize courses for workers of several related specializations and thus give them a wider range of their knowledge.

1.2.2. educating a specialist who would not be strictly connected with any particular branch, such as people specializing in the electronic calculation technique, organization of work, etc.

1.2.3. increasing the student's knowledge and qualifications by introducing to him some problems from related branches.

The period of time necessary to become such a specialist varies from two to four months.

1.3. Qualifying a worker for a new specialization within the period of time from two to four semesters.

1.4. Individual specialization, which is usually the preparatory stage before taking the doctor's degree.

2. Short-term professional improvement:

2.1. Getting acquainted with the novelties, developments, and current problems in that particular branch of science and technology which is directly connected with their jobs. Such courses should last for 15 to 30 days and should be compulsory for every worker every five to eight years.

2.2. Seminars for specialists working on similar and related problems. Their duration depends on their aims. Long courses can be run

only by schools of academic rank. Practically, short-term courses are dominating, although their share in the total number of courses has been decreasing. In 1970 the share of short-term courses and their students amounted to 61 percent. Students of these courses are recruited by the given department which has signed the agreement with the university. Students willing to attend long-term courses are supposed to go in for a competition, as only the best of them can be accepted. At the end of each course they are supposed to take an exam. It should be stressed that after courses qualifying a worker or requalifying him for a new specialization, all students ought to take an exam in the presence of the specially appointed committee.

The following tasks are considered to be specially important in the field of professional improvement:

1. To bring to an end the organizational stage and create the Head Office of Professional Improvement
2. To increase the role and importance of the interdepartment committee and stir it into activity
3. To reform the organization of the professional improvement sections dealing with additional training at universities and engineering colleges, making a more extensive use of long-term courses
4. To improve the system of planning additional training, especially in departments
5. To perfect didactic methods at universities, reduce the number of lectures, encourage students to work more intensively, and keep students informed about the work of a modern industrial plant

6. To improve the material-technical base of additional training centres and living conditions of students
7. To create a scientific institution at the Committee, the task of which would be to study all the methodical problems of additional training

CZECHOSLOVAKIA. The legal base for the organization of postgraduate studies was created by the Bill on Schools of Academic Rank (1966) and by the Act of the Government No. 52 (1967). According to the latter document, postgraduate studies are organized by different schools of academic rank and are a continuation of the university of education. Programmes should be carefully prepared to serve its purposes. A high academic standard should be maintained.

The main tasks of the postgraduate studies are:

1. To qualify specialists with academic diplomas for their future work in a short-range specializations
2. To acquaint students with new achievements of science and technology in their specialization

Postgraduate studies can be organized during working hours, in the evening, in the extramural form, as a university extension outside working hours, or can be a combination of different forms.

Proposals and motions to organize the department of postgraduate studies in the given branch are submitted to university departments by state organs of the central authorities and managements of individual research institutes, as well as other organizations. Having taken the proposals into consideration and having received recommendations of the senate, rectors of universities call postgraduate departments into being.

It is the job of the university departments jointly with the organs of the central authorities to organize the studies and elaborate their programme, and it is the job of the university's dean to formally approve it. Candidates are selected by central offices which supervise the enterprises where the students are employed, but the final decision is taken by the dean. At the end of the three- or four-semester studies, students take an examination in the presence of the examination committee. They are supposed to sit for a written exam and prove their theoretical knowledge in writing. Then they are to give answers to different questions orally, or even show their practical abilities.

After the exam has been satisfactorily passed, the students receive a diploma with the name of the specialization they have studied.

Postgraduate studies are financed by the organizations for which they have been organized under special agreements or by universities--if the additional training is organized following the instructions and at the recommendation of the Minister of Education.

Apart from postgraduate studies, many courses are organized in Czechoslovakia. Their aim is to increase and supplement workers' knowledge. They are mostly short courses organized in enterprises and firms by scientific-technical associations--C.S.V.T.S. and the so-called socialist colleges.

The above-mentioned scientific-technical associations are active in the field of increasing workers' qualifications by means of lectures, conferences, seminars, excursions and film showings. Courses organized during working hours, extramural courses, as well as those combining some elements of both, are considered to be most effective. The subjects included in the programme of studies are strictly connected with the needs of departments

or other institutions. The activity of the scientific-technical associations (C.S.V.T.S.) is aimed, first of all, at improving qualifications; increasing labor efficiency, which can be achieved through the practical application of new technologists and innovations; improving the quality and reliability of products; better uses of energy and materials; protection of the natural environment; and introducing computers and developing automatic systems. Such courses are mainly organized in those branches where there is a shortage of highly qualified technicians and economists.

Extramural courses mostly deal with the electronic calculation technique and, on a smaller scale, with value engineering/value analysis.

Courses organized by Technical Clubs are mainly concerned with current technical and, first of all, technological problems and are accompanied by numerous courses of foreign languages, mostly Russian.

Courses of local sections of the scientific-technical associations are mainly devoted to the problems of natural environment protection, improvements of managing systems, and quality of products.

In the near future the scientific-technical associations (C.S.V.T.S.) will aim, first of all, at establishing a uniform system of additional training and professional improvement in the whole country.

At present, much attention is being paid in Czechoslovakia to post-graduate additional training of technicians in order to qualify them for a given specialization. As a rule, such courses last for 3 semesters with 2 days of classes every week.

THE GERMAN DEMOCRATIC REPUBLIC. In the German Democratic Republic, research work connected with the problems of increasing qualifications of employees was, in previous years, organized on a large scale but in a rather incoordinated way. In 1968 the Council of Ministers passed the

act entitled "On principles and tasks in the field of increasing qualifications." It defines the main principles and aims in the field of improving workers' professional skills and abilities and pays considerable attention to the problems of responsibilities of industrial plants, works, unions, and ministries for additional training and professional improvement of the staff. According to the act, the majority of tasks connected with the problem of postgraduate studies have been vested in the system of education in the country. The educational system should pay special attention and attach much significance to:

1. The implementation of special tasks in the field of increasing qualification of workers for the needs of different unions, ministries, works, and industrial plants
2. Creating the possibilities of completing special training and getting special qualifications confirmed by official certificates (Such possibilities should be created in those branches which are particularly important for the national economy.)
3. Increasing, extending, and deepening the theoretical knowledge in the workers' specializations and other related branches

Schools should organize additional training in some selected branches, as well as long-term courses.

Therefore, September 1, 1968, an Institute for Increasing Qualifications was called into being. The institute has been subordinated to the Ministry of Academic Schools and Vocational Training. It specializes in the problems of additional training and postgraduate studies and is held responsible for planning and coordinating research work in that field.

It should be stressed that in the German Democratic Republic much attention is being paid to increasing qualifications of women.

The act of the G.D.R.'s Council of State of April 3, 1969, concerning the third reform of universities and other schools of academic rank and their development until the year 1975 contains also some fundamental guidelines in the field of additional and postgraduate training for workers with academic diplomas. The above-mentioned act considers the postgraduate studies to be one of the most important social needs. The main task of the studies is to equip students with some special professional knowledge connected with their jobs. Another task is to make them constantly and regularly repeat and refresh and increase their knowledge. Such a programme should be a real and significant element in the professional career of each worker with a secondary-school or university diploma. Managers of firms and enterprises are held responsible for inserting a clause on compulsory and obligatory additional training into the contracts of their employees.

Universities and other schools of academic rank, as well as their branches, will tighten and develop their cooperation with the Chamber of Technique and also with academies of science in the scope of postgraduate studies and professional improvement.

Various departments (colleges) at universities, but first of all those which are most significant for the major sciences, prepare programmes of additional training basing on some predictions and estimates of the future development of the given branch. Those programmes should be accepted by representatives of the economic circles with some practical experiences. The scientific staff of academic schools can also influence (within the cooperation agreements) the programmes of additional training which are organized by plants in the form of factory schools, industrial specialistic universities, and others.

In order to ensure the highest possible standard of additional training and postgraduate studies for scientific and didactic workers of academic schools, employees of research institutes, and managers, numerous Centres of Professional Improvement are being created--mostly in those branches which are especially important for the planned changes in the economic structure and for reaching the high world standard by the country's national economy.

Universities and other schools of academic rank will develop the following forms of professional improvement: intensive courses, supplementary courses studies for voluntary nonenlisted students, postgraduate studies, and periods of special training abroad (practice abroad), especially in the Soviet Union.

Extramural and evening studies aimed at refreshing and deepening workers' theoretical knowledge and increasing their qualifications will be more rationally organized, thanks to their shorter duration. It will enable many workers with only vocational training to get a diploma from a school of academic rank.

Under the agreements between universities and schools of academic rank on one side, and other social organizations dealing with additional training (Urania, scientific associations of the Chamber of Technique, DSG) on the other side, it is possible to organize short-term postgraduate studies for university graduates and people with vocational training from all the branches of the national economy.

The Chamber of Techniques, in accordance with some acts and regulations of the country's government, organizes short-term additional training for scientific workers, engineers, economists, foremen, skilled workers, and innovators.

About 90 percent of all the forms of additional training in the GDR are organized by the Chamber.

The aims and programmes of the educational activity of the Chamber are defined in the regulations and documents resulting from the long-term plans of the scientific-technical development, as well as from the plans and documents of factories and institutions.

About 3,000 factory sections organize lectures, seminars, topical consultations, exchange of experiences, excursions, etc., according to the needs of the industrial plant. Of great importance are annual "Weeks of the Chamber of Technique" or "Days of the Chamber of Technique." In 1975, 48,139 postgraduate courses were organized by the factory sections. The courses were attended by 738,793 participants.

Fifteen regional offices supervise, in accordance with the guidelines of the Head Office, the work and activity of factory sections. Some specific needs of the region are also taken into consideration. With some help from regional professional sections, working groups and committees, the above-mentioned regional offices are able to give assistance to factory sections.

The regional offices organize both intramural and extramural courses, meetings of specialists, conferences, and exchanges of experiences. The detailed programme reflects some specific needs of the given region and is in conformity with the guidelines of the Head Office of the Chamber of Technique. In 1974 the number of courses, organized with the participation of 126,366 people, amounted to 3,850. In 1975 a very considerable increase in the number of short courses was recorded. They were dealing mainly with the ways of saving raw materials, quality and reliability of products, application of new technologies, and protection of the natural environment.

The number of courses of that kind reached 1,694 in 1975. The number of participants amounted to 48,563 students. Extramural courses also recorded the increasing popularity with the constantly increasing number of students.

The Head Office of the Chamber of Technique and its associations of specialists, scientific-technical associations, committees, and central working groups concentrate their efforts on the problems of defining aims and tasks in the branches of particular importance. They also promote the exchange of experiences concerning the methods of postgraduate training, as well as the idea of organizing national and international congresses, seminars, and specialistic conferences. All the events which are organized by the Chamber are closely connected with and are an essential part of the activity of the Leipzig Fair. Special working teams prepare the detailed programmes of courses which are later organized by regional offices.

Summing up, in 1975 all the sections of the Chamber of Technique organized 64,392 courses with the participation of 1,174,248 scientists, engineers, economists, innovators, skilled workers, and foremen.

In the same year, some new financial regulations were introduced at universities and other schools of academic rank. The funds allocated for additional training and postgraduate studies were dependent on the results achieved. The Ministry of Academic Schools and Vocational Training has been preparing new financial regulations and guidelines concerning the material and human base of the universities' activity in the field of additional training. The above-mentioned activity has been carried out within the framework of special agreements.

POLAND. The main forms of professional improvement, apart from each engineer's self-education, are:

1. Postgraduate studies
2. Other forms, such as courses, conferences, etc.
3. Practice after graduation

The legal base for the organization of postgraduate studies at universities and other schools of academic rank has been created by the special act on academic schools of November 5, 1958.

Postgraduate studies are organized by rectors of academic schools in accordance with the regulation of the Minister of Science, Technique, and Schools of Academic Rank. The act initiating the organization of postgraduate studies defines their aims, duration, and system of teaching. It has been also stressed in the act that, during the postgraduate studies, a specially prepared and accepted general programme of the studies should be followed.

On November 30, 1965, a Bill of the Council of Ministers was issued dealing with the problem of increasing qualifications of workers employed in the national economy. The final text of the bill, with all the changes that have been introduced afterwards, (published in Monitor Polski No. 16 of June 1, 1970) has been the basis for executive regulations of ministers which provide, among other things, for:

1. Organizing postgraduate studies as one of the main forms of professional improvement and increasing qualifications of workers employed on the jobs where academic education is necessary, and
2. organizing compulsory additional training and professional improvement of workers, based on the requirements of their jobs. The training can take the form of postgraduate studies, the programme of which will be strictly connected with the job of the student.

The first postgraduate studies in Poland were already educating their students after 1957. Their most important development took place, however, after 1960, which can be clearly seen from Table 1.

Table 1
TECHNICAL UNIVERSITIES

Year	Number of courses	Students	Graduates
1961		288	45
1965	39	175	916
1970	133	3,357	757
1977		4,237	2,561

Postgraduate studies that have been organized up till now are various, as concerns the number of lecture hours (from 80 to 400), number of subjects anticipated in the teaching programme, (often from 3 to 30 hours for one line of studies), as well as the number of lecture hours in proportion to the number of classes. (Courses of studies exist whose programme is based on lectures only.) These differences depend on the type of university as well as on the engineering college which organizes certain postgraduate studies. The exceptions here are agricultural academies in which a majority of postgraduate studies of the same line are conducted according to the same teaching programmes, the number of lecture hours and terms being, in general, the same.

There emerge also some special features common for postgraduate studies. Their duration, with a few exceptions, lasts 2 terms, and the system of lecturing and training is, in the greatest part, based on extramural and evening courses.

The programmes of the studies discussed are systematically supplemented and improved. In recent years, there appeared to be a certain regress in the development of postgraduate studies. It is caused, to some extent, by Act No. 246 of the Council of Ministers, which restrains allowances and benefits for the students of postgraduate studies, and also by unsufficient adjustment of programmes to the needs of the students.

In their programmes, universities include an unreasonable amount of material (as much as for a regular course of engineering studies), their laboratories are insufficiently supplied, and there is too little material which could be used in the current work of graduates.

The courses are arranged in different forms, during working hours, evening, and extramural, mainly by Scientific and Technical Associations and training centres of economic departments. There appear to be some difficulties as concerns the coordination of the work of the courses, for technical training is not supervised and directed by one body, but by the Ministry of Education and Schools of Academic Rank, responsible for further education, and by the Ministry of Education, responsible for secondary education.

Postgraduate studies are organized first of all with the aim of specialization and refreshment of knowledge, which requires certain supplementary theoretical information. The classes require 150 to 200 hours of organized work. They are conducted in groups of 20 to 25 persons, and they are completed by passing a final examination. A certificate is issued, proving the student has finished the course.

Postgraduate courses include courses of advanced mathematics for engineers and scientific workers organized by the Polish Academy of Science. They comprise a series of 10 to 12 lectures, each series

concerning a certain definite section of mathematics. These lectures are given three hours every week over a period of one to two terms, and they are attended by several hundred engineers.

Specialization courses are mainly organized by the Chief Technical Organization, scientific and technical assocations, and the training centres of economic departments. In various domains of our economy, the division of tasks between the department and associations is different. The teaching load of the above-mentioned courses comprises 50 to 100 hours.

The Chief Technical Organization trains annually 140,000 engineers and technicians in approximately 4,300 courses. Engineers constitute about 40 percent of the total number of attendants.

Besides, there are organized seminars, the objective of which is to inform about a definite, new working method, new devices, and the use of new materials. Such seminars comprise 15 to 25 classes. On the average, there are 16,000 seminars of that kind, in which approximately 450,000 engineers and technicians take part.

A new form of increasing one's knowledge is controlled self-education, initiated by the Association of Polish Mechanical Engineers. It relies on carrying out a certain specified programme based on the self-teaching method and grounded on suggested materials, working through appropriate laboratory works, and participating in scientific conferences and trips. The participants work unaided under the supervision of a consultant having suitable qualifications. The programme is estimated for 4 years and includes the performance of a diploma work, which as a rule concerns the technical problem of the work where the participant is employed. The student who has worked through all the

material and has passed the final examination, during which he presents his diploma work, receives a certificate equal to the postgraduate diploma.

Still other forms of increasing qualifications organized by the Chief Technical Organization are: home and international scientific conferences, lectures, exhibitions, and competitions.

In recent years, about 2.6 percent of the total number of engineers have taken part in practices abroad, lasting more than 3 months. It is easy to understand that for special reasons employees of various branches of industry had a varied share. On the whole 3.2 percent of engineers working in industry participated in these courses. In fact, the participation of employees working in industry was higher because the group of engineers from the "Science" department who took part in the courses consisted, in a great part, of industrial research institutes' employees.

Taking into consideration the opportunities of getting acquainted with the foreign technological line, thanks to the purchase of licenses, machines, and devices, we can admit that the number of practices abroad is adequate to meet the requirements of increasing qualifications.

The management staff is trained by the Management Studies Institute as well as educational centres at 18 departments dealing with the additional training of the management staff. The latter exist, generally, at the one-line institutes of organization. The Management Institute plays a leading role because it has at its disposal its own specialized staff, a very good technical base, and cooperates with specialists from abroad.

A very important warrant for improving qualifications is given by amendments to the bill No. 306 of the Presidium of the Government, passed at the initiative of technical associations (Chief Technical Organization).

This bill brings in the so-called vocational specialization degrees, which are equivalent to the scientific degrees granted for professional achievements in construction and technology.

Criteria required for attaining degrees in specialization are constructed in such a way as to give priority to creative achievements and to encourage improvement of qualifications.

Obtaining a degree in specialization is enhanced by granting special benefits. Two degrees of professional specialization have been accepted.

The engineer wishing to obtain the first degree of specialization should prove himself fit by:

1. Authorship/coauthorship of a work showing his original, creative, scientific ideas and construction as well as technology or organizational solutions which can be used in practice and which would contribute significantly to progress in technology
2. An important creative cooperation in the work of bringing in his own or adapted technical solutions, starting the production of complex products or launching new or modernized production departments

3.a. Working out and introducing laborsaving propositions, being of great importance for increasing the efficiency of production

b. Mastering two foreign languages to a degree that would permit him to read professional literature

c. Completing satisfactorily postgraduate studies connected with his speciality, controlled self-educational studies, or a course of the III degree.

The first degree of specialization is to some extent similar to entering a candidate's name into the register of engineers in Anglo-Saxon countries.

Candidate wishing to obtain the second degree of specialization should prove himself fit by:

1. creative achievements, and particularly:
   a. Achievements that were awarded state prizes, prizes granted by the Minister of Education and Schools of Academic Rank or appropriate minister for scientific research works, works in the field of construction and technology initiative work, prizes granted by the Chief Technical Organization, Association of the Architects of Polish People's Republic, Association of the Polish Town-Planners, as well as other prizes important for the national economy
   b. Patents or designs applicable in the field of specialization in which he wishes to obtain a degree
   c. Solving, for the first time in the country, constructive and technological problems or a creative adaptation of existing solutions to new conditions that could be of significant importance to the progress in technology and organization.
   d. (1) Launching a new production and technological line, or introducing a new organizational solution into the field of production, as a result of which real economic effects have been reached
      (2) Mastering at least two foreign languages, one of which he should know fluently
      (3) Completing satisfactory postgraduate studies

The second degree of specialization should be equivalent to the degree of doctor of technical sciences and results in similar rights. The degrees of specialization are granted by the minister, but the

estimation of his achievement and preparation of the proposal are worked out by technical associations. The coordination of all activities connected with granting specialization comes within the duties of the Minister of Education and Schools of Academic Rank.

At present, preparations for a considerable extention of the range of additional training are being made. It is caused by the idea that half of the degree holders should attend postgraduate studies, the aim of which is further specialization, 5 years after they have obtained a diploma. The programme of these studies should take into account theory as well as ability to operate modern devices.

ROMANIA

Until quite lately, main stress has been put on increasing the number of engineers having a doctor's degree. Postgraduate studies have been run only for economic engineers belonging to the managerial staff of an enterprise. Other workers with a university degree were given the possibility of taking part in short, special courses organized by ministries and other central departments.

Under the educational act promulgated in the Romanian People's Republic in 1968, studies and postgraduate courses based on new principles and adjusted to the requirements of the national economy, were organized at the universities and some research institutes. According to this act, both the speciality nomenclature and professional improvement programme are approved by the Council of Minister at the suggestion of the Minister of Education, who before tabling his motion must discuss it with the National Board of Scientific Researches and departments interested in the problem.

This act provides that postgraduate studies will be organized at the order given by ministries and that this task (organization of studies) will be performed by the Ministry of Education together with the ministries concerned. These studies will be run at the universities, research institutes, and big industrial enterprises, but whether they will be permanent or periodical will depend on the needs of the country's economy. On the whole, they should not last longer than 12 months. The objective of the studies will be the increasing of knowledge within the scope of a particular speciality, mastering new methods and technics in carrying out research, and training the staff of specialists for managing and organizing production.

Postgraduate studies are meant for employees having a university degree. Candidates are directed to them at the suggestion of ministries, but for some specialities the candidates must take a competitive entrance examination. Classes are conducted by the best specialists of universities, research institutes, production, and state apparatus. Lecturers for some specialities may be invited from abroad (e.g., in the field of new technology).

Participants who have to attend the courses during their working hours receive full pay together with the bonus, the amount of which is estimated at the yearly average of the last year of working.

Students in the evening courses and extramural studies are entitled to a 10- to 25-day unpaid leave. Students coming to the classes or examination from another town are paid travelling expenses. If a student attends intramural studies, the time spent on attending classes is included in the working hours.

The cost of organizing the courses and postgraduate studies, as well as their activity is covered, for the participant coming from the economic units, by these units from their floating assets and for those coming from the offices, from the state budget. The cost of additional training of specialists for new enterprises which are being built or which will be built in the near future is covered from their investment fund. Participants who will complete postgraduate studies receive certificates and the ministries which have directed them decide where they should be employed and to what higher rank they should be promoted.

HUNGARY

In the Hungarian Peoples Republic, the problem of increasing qualifications is dealt with by the Institute for Increasing Qualifications of Engineers, technical colleges, and the Scientific Technical Association (METESZ).

Qualified engineers are not obliged by law to attend extension courses, but the economic ministries and enterprises may require from their employees the increasing of their qualifications in order to meet the needs of the enterprise. Ministries take an active part in the selection of candidates; they inform the engineering and technical staff about the courses being organized; they collect announcements, give characteristics of candidates, and delegate their representative, who will take part in the works of the enrollment board. Participants enjoy certain allowances: Their working time is shortened; they have additional leaves; their traveling expenses and cost of accommodations are covered. The range of the above-mentioned allowances depends in general on the results a student has obtained in the course.

The Institute for Increasing Qualifications of Engineers was called into being in 1960-1961 as a self-dependent body subordinate to the Ministry of Culture and Education. Its task is to train engineers for some definite needs of industry, but the number of courses is defined by appropriate branches of industry. The number of classes at particular courses differs and depends on the qualifications the graduate is supposed to acquire. The programme of the course includes only subjects which are strictly connected with the principles of the course. Classes, in general, are given in the evening hours, once or twice a week. On these days, the work time of the participants is shortened. In case of a large number of attendants coming from other towns, classes are run during work time once or twice a week or once a fortnight.

Teaching programmes of individual courses and the subjects taught are based on the suggestions submitted by enterprises concerned, as well as on the proposal of the institute itself worked out from questionnaire surveys of engineers interested in the courses. The basic form of schooling is lectures. In particular cases, laboratory and practical training classes are included in the programme. Students apply individually through their enterprises. The candidate is not obliged to possess a university degree of an engineer and no entrance examinations are organized. Those who complete the course receive a certificate.

Lectures at these courses are given by university lecturers, as well as by specialists from the industry. The institute issues summaries of lectures which are highly appreciated by technical circles. This can be proved by the fact that 80 percent of the copies are purchased by the enterprises and individual specialists.

General courses are financed from the budget of the institute; courses on a definite subject are organized at the request of enterprises and their cost is covered by the students. Later he is given back the money by his enterprise.

At present, works for reorganizing the institute are carried out and they will result in giving its branches in Budapest, Weszprem, and Miscolc, the status of technical universities departments.

In these towns, technical universities have been organizing post-graduate studies since 1961. Their aim is to acquire specialization in definite spheres. Studies for specialists are run in the form of evening courses.

Educational activity of METESZ consists of three parts:

1. Cooperation in the development of the school system carried out by examining the school level, criticizing and working up suggestions, rendering assistance for preparing school books and schooling materials; and carrying out analytical surveys of vocational schools from the point of view of the necessities of all professional stages. This work is carried on by the METESZ central commission of education.
2. The scope of activities of member organizations belonging to METESZ includes the following:

   Special commissions of member organizations work on the tasks resulting from directives of the central commission and discuss current problems concerning the training of skilled manual workers, as well as organizing additional training for engineers. Particular stress is laid on extending abilities for using computers, on quality normalization, and management. Though member associations agree that

the responsibility for organizing and running additional training courses lies with the state, they also run them, as there exist a number of shortcomings and gaps, and they feel obliged to help the state in this sphere. In 1974 the central boards of associations organized 238 courses with 14,250 participants, and their regional branches organized 302 courses. Additional training is also extended by lectures, series of lectures, discussions, symposiums, conferences, professional trips, issuing magazines, textbooks and handbooks. Some associations organize competitions and award prizes for good results attained in self-training. Some study the demand for professional staff.

The Central Education Commission of the Managing Board has a number of scientific teams that work at the problems of training manual workers, of education in the secondary vocational school, teaching natural sciences at secondary schools, and a vast number of problems as regards the education at Technical Universities, namely, entrance examinations, modernization of the system of training engineers, additional training of economic engineers, and new methods of education and their application.

Besides, the central commission cooperates with the government and social bodies and controls international cooperation.

3. The third scope of activity is to adjust the work of METESZ to perform the tasks assigned by the XI Congress of the Hungarian Workers Party, as well as to create an integrated system of educational and additional training. At present, the problem of increasing qualifications is being broadly discussed. In order to create a proper system of additional training, the methods which

have been used for the last 10 to 12 years are being carefully analyzed.

THE SOVIET UNION

Since 1960, additional training has been a matter of special concern to the Central Committee of the Comunist Party of the Soviet Union and the Soviet Council of Ministers, which have passed a number of special resolutions. According to one of them, the main factor of improving qualifications are universities, the major inseparable task of which should be the training of specialists with a university degree, as well as carrying on further training.

Professional improvement centres are called into being by ministries and other organs of the Soviet Union as well as by the Councils of Ministers of Republics. The fact of calling them into being must be discussed with the Planning Commission of the Soviet Union, Ministry of Schools of Academic Rank and Special Secondary Education, and the Ministry of Finance of the Soviet Union. The professional improvement centres comprise:

1. Professional improvement institutes and their branches
2. Additional training departments opened at universities
3. Professional improvement courses at ministries
4. Professional improvement courses at enterprises, scientific research institutes and designing offices of technical universities and vocational secondary schools

The Government Act No. 5/5 of 6th Nov., 1967, states that the professional improvement institutes should be called into being at each economic ministry. The institute is the organizational and methodical body, controling the whole system of increasing qualifications in a

given branch of economy and it is organized as an independent technical college on a self-financing basis.

It consists of departments and scientific laboratories, and in the places of a big concentration of enterprises of a certain economic line, branches of the institute can be opened.

Teaching programmes of individual courses are worked out by the institute and approved by the ministry the institute is subordinate to.

Much importance is attached to the student's active participation in carrying out laboratory and practical works, solving concrete problems concerning the plants, working out reports, and final work. The students are admitted to the course by the managing director of the institute in the grounds of the letter of recommendation sent in by the candidate's enterprise and in conformity with the admission plan approved by the ministry. Classes are conducted in groups of 20 to 25 students. If the course is arranged during working hours, the employees attending the course receive full pay at their enterprises, and in some cases special scholarships are granted.

The cost of accomodations and traveling expenses are covered by the enterprise directing the candidate to a course. The cost of text-books and educational aids is covered by the institute.

The cost of running the course is covered from central funds, created from special payments (the amount of which depends on the cost of the course) affected by production enterprises and others, foreseen in the financial plans for increasing qualifications.

There are various forms of completing the courses and testing the results. The most popular form is examinations during which the student performs his final work project. The students who have fulfilled all

the conditions receive certificates of a standardized form which has been approved by the Ministry of Schools of Academic Rank and Secondary Vocational Schools, but they do not acquire any special rights.

Apart from the institutes, there may be opened professional improvement departments at universities. There exist no essential differences in the organization and the work between university departments and professional improvement institutes.

Professional improvement courses organized at the ministries and central organs--the teaching load comprised 300 to 320 hours--last 2 months when they are run during work time, or 6 months when they are run outside working hours. These courses have a more practical bias than the above-mentioned. Theoretical studies take about 20 percent of the time foreseen for studies.

Television is of major importance here, as it is the best and quickest way of conveying information, letting the specialist get acquainted with recent achievements in science and technology, and spreading information on the experiences of the leading works.

The work of the centres specializing in increasing qualifications is completed by the activity of the All-union Scientific and Technical Association (WSNTO).

WSNTO pays particular attention to the integrated problems of training and improving qualifications of engineers and management staff, improving qualifications of productive workers, mathematical education of engineers, problems of evening and extramural schooling, new methods and means of education, testing specialists, developing technical production methods of forecasting the demand for specialists, and conducting statistical and sociological studies of increasing qualifications.

WSNTO organizes centrally nationwide conferences and symposiums on major problems and, for instance, in 1975, together with the economic and mathematical institute of the Soviet Academy of Sciences, within the framework of an integrated problem "Optimum planning and managing of the national economy," it was organized a sumposium on "Defining the national economy demand for specialists." At this symposium, problems connected with the lines of training for the engineering technical staff and finding out a method of defining the demand for specialists were analyzed. They also discussed the problem of coordination of the works aimed at improving the system of planning, training, and distributing the specialists.

The second conference held in 1975 was organized jointly with the Ministry of Schools of Academic Rank and it dealt with the technical means of education such as the latest teaching and testing machines, and proper method of using them, as well as the prospects for their further development.

Technical associations organize, at the trade union clubs, (WSNTO technical centres) "universities of technical progress and economics." At these universities there are organized, outside working time, conferences at which the problems connected with the direct and concrete activity of specialists are discussed.

Technical centres organize, under the charge of Scientific and Technical Association, courses and seminars devoted to current technical matters. Among specialists the quality Laboratories, which have been created at the technical centres at the Moscow Polytechnical Museum, are very popular. They organize a series of lectures and consultations dealing with the problems of concern to workers representing various professions.

The basic organizational cells of WSNTO carry on their activity in the enterprises, organizing regular classes on current problems, as well as extra (separate) lectures delivered by eminent experts and highly qualified engineers.

The role of the scientific and technical associations depends not only on organizing this or that form of increasing qualifications but also on creating in working places the conditions and atmosphere that will attract and enable all specialists to increase their qualifications and help to select the most rational forms.

V CONCLUSIONS

Although this was the first international conference on continuing engineering education, other world conferences have been held for decades. World conferences are unique in their ability to bring together peoples of many nations. The First World Conference on Continuing Engineering Education was no exception.

The overall objectives of this conference were (1) to provide a forum for discussion of international issues, (2) to provide a platform to improve the exchange of ideas and programs, and (3) most important, to provide the opportunity for countries to enhance continuing education programming by learning from others. The effectiveness in meeting these objectives is not tested simply by this document but by future developments, joint country developments, and future world conferences.

Planning for the Conference began in January 1977. In the following two years, five planning meetings were held, thousands of letters and phone calls crossed continents, and tens of thousands of flyers were sent out. As a programming lead, two years was a minimum amount of time. The search for cosponsors, speakers, and funds was started early in the time schedule. The host country had the most important part to play and had to be willing to commit the resources necessary. The planning committee was knowledgeable in the full complement of continuing education activities and was willing to commit an enormous amount of time.

The time commitments of persons for this Conference were many. The General Chairman allotted 10 percent of his time the first year and 20 percent the second year for Conference activities. The cost of supporting the General Chairman's activities required about 30 percent of

of a secretarial position and about $3,000 in telephone, telex, and other supporting costs. The person responsible for publicity and preconference proceedings (Joe Biedenbach) spent at least 10 percent of his time each year. The preconference proceedings cost approximately $11,000. The host institution and Arrangement Committee time was extremely difficult to calculate; there were literally thousands of hours spent. The chairman of the Arrangement Committee and the local host set up an elaborate management scheme. The Arrangement Committee also took care of the budget, registration, and other local arrangements. The cost for the entire conference exceeded $200,000.

There were problems during the Conference. With three official languages—English, French, and Spanish—there were difficulties with the simultaneous interpretation and with defective receiver units. In retrospect, the quality of both the translators and the equipment should have been more carefully screened. There were some speakers who were ill prepared and their presentations arduous to translate. Details, such as caring for individual problems and moving people to and from sessions, could have been improved. Participants could have had more time to consult with speakers and other experts in attendance.

Despite the problems, reactions of the participants were positive. The letters received since the Conference exhibit the success of the Conference also.

The outstanding features of the Conference were:

- Two years of planning and promotion
- Good cosponsorship
- A wide variety of speakers from throughout the world
- Alvin Toffler—its keynote speaker

- Proceedings available at the Conference
- A lot of communication between speakers and planners
- Over 600 participants
- 56 countries represented
- From the host institutions, outstanding extracurricular activities and evening events
- Postprogram report

The Conference participants recommended that the Second World Conference on Continuing Engineering Education be planned for 1983 and that the present planning committee be responsible for selecting the place and the new planning committee. This will be done. The present committee will meet in January 1980 to lay out the plan.

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